

Report on the Implementation of the National Programme  
for Handling of Spent Nuclear Fuel and Radioactive Waste in Slovak  
Republic for the Year 2018

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**IN BRATISLAVA ON 8 APRIL 2019**

## List of abbreviations

AKOBOJE	Physical Area Protection and Barrier System
BIDSF	Bohunice International Decommissioning Support Fund
BM	Board meeting of MH SR top management
Chrompik ČR	aqueous solution of chromium and potassium dichromate $K_2Cr_2O_7$ The Czech Republic
DR	Deep Repository
DS	Long-term storage
EBO	Nuclear Power Plants Jaslovské Bohunice
EBRD	European Bank for Reconstruction and development
EC	The European Commission
EIA	Environmental Impact Assessment
EMO	Nuclear Power Plants Mochovce
EU	The European Union
EURATOM	European Atomic Energy Community
FCC	Fiber concrete container
FS LRAO	Final processing of LRAO
HLW	High-level radioactive waste
IAEA	International Atomic Energy Agency
ILW	Intermediate-Level Radioactive Waste
IRAW	Institutional Radioactive Waste
IS RAW	Integral Storage Facility for Radioactive Waste
ISDC	International Structure for Decommissioning Costing
ISFS	Interim Spent Fuel Storage Facility
JAVYS, a. s.	Nuclear and Decommissioning Company joint stock company/Jadrová a vyrad'ovacia spoločnosť
JOPRAD	project Joint Programme on Radioactive Waste Disposal
LLW	Low-Level Radioactive Waste
LRAW	Liquid Radioactive Waste
MH SR	Ministry of Economy of the Slovak Republic

MŽP SR	Ministry of Environment of the Slovak Republic
NI	Nuclear Installation
NNF	National Nuclear Fund
NPP A1	Nuclear Power Plant Jaslovské Bohunice A1
NPP V1	Nuclear Power Plant Jaslovské Bohunice (units 1 -2)
NR RAW	National Repository for RAW
NRA SR	National Regulatory Authority of the Slovak Republic
PC	Primary circuit
PDS	casings of Long-term storage
PMU	Project Management Unit
RAW	Radioactive Waste
SE, a. s.	Slovak Power Plants, joint stock company/ Slovenské Elektrárne
SIEA	Slovak Innovation and Energy Agency
SNF	Spent Nuclear Fuel
SNUS	Slovak Nuclear Society
SR	The Slovak Republic
SRAW	solid radioactive waste
STU	Slovak University of Technology
THERAMIN	project Thermal Treatment for Radioactive Waste Minimization and Hazard Reduction
TSÚ RAW	Technology for Treatment and Conditioning of RAW
ÚJV	Institute for Nuclear Research, Czech Republic
VLLW	Very Low-Level Radioactive Waste
VUJE, a. s.	VUJE, a. s. Trnava Engineering design and research organization, joint stock company
WWER	Water-water power reactor
ZČJE	Final Stage of Nuclear Power Engineering
ZMOS	Associations of Local Authorities

## **1. Introduction**

The National Programme for implementation of the National Policy for Management of the Spent Nuclear Fuel and Radioactive Waste (hereinafter referred to as “National Programme”) approved by the Government of the Slovak Republic by the Decree No. 387 of July 8, 2015, has been sent to EC pursuant to the Directive 2011/70/EURATOM in August 2015. Therefore, it has become the strategic document for the Final Stage of the Peaceful Use of Nuclear Energy in the SR. Pursuant to § 6 section 9 of the Act No. 308/2018 Coll. on the National Nuclear Fund, the Board of the Governors of the NNF shall develop jointly with JAVYS, a. s. (legal entity pursuant to § 3 section 9 of the Atomic Act) and holders of authorization or permission of the Nuclear Regulatory Authority of the Slovak Republic (§ 5 section 3 and § 8 section 3 of the Atomic Act) the Report on Implementation of the National Programme for the preceding year, annually. The Board shall submit it to the Ministry of Economy of the SR for approval, supplemented by the Opinion of the Nuclear Regulatory Authority of the SR. As the new Act on the NNF, which entered into force on 1 January 2019, was adopted (see the partial objective No. 1), the Act No. 238/2006 Coll. expired on 31 January 2018, whereby submitted Report has been developed pursuant to the Act No. 238/2006 Coll.

Report reviews implementation period of the National Programme to date December 31, 2018. The Report is based on contributions provided by MH SR, JAVYS, a. s., SE, a. s. and NNF, follows on from the Report for the period of 2017, considering current progress in the area of decommissioning of nuclear installations, management of SNF and RAW and the radioactive materials of unknown origin in 2018 in the SR, related to policies, intention and objectives specified in individual chapters of updated National Programme for the years 2016 – 2021.

Progress in the area of meeting short-term and long-term objectives specified in the Chapter 1.2 of the National Programme is given in the Chapter 2 of the Report. The objectives No. 2, 7, 9, 11 and 12 are not included in the chapter, as they have been evaluated in the previous reports as met. Overview of inventory of RAW, respectively SNF is updated in the Chapters 3 and 4. Progress made in the area of development of deep repository is described in the Chapter 5 and activities in the area of research, development and demonstration activities are summarized in the Chapter 6. Concise balance of existing costs spent for the Final Stage of Nuclear Power Engineering in SR, as well as current status of total assumed costs including the way of securing of adequately accumulated funds to cover the costs are described in the Chapter 7. Recommendations for further period of the National Programme implementation monitoring and initiatives for the next following update of the National Programme planned for 2019 – 2021 are summarized in the Chapter 8.

## **2. Meeting the objectives of the National Programme for Management of the Spent Nuclear Fuel and Radioactive Waste**

Partial objectives of the National Programme are grouped under six categories: infrastructure and legislation, decommissioning of nuclear installations, management of the radioactive waste and the spent nuclear fuel in general, disposal of the radioactive waste and the spent nuclear fuel, research and development and transparency. Status of meeting those partial objectives (measures) is described in next sections followed by sequence numbers 1 to 19 dated 31 December 2018.

Seq. No.	Measure	Deadline	Responsible
<b>In the area of infrastructure and legislation</b>			
1.	<p>To amend the Act on the National Nuclear Fund fundamentally and other subsequent legislative documents with objective:</p> <ul style="list-style-type: none"> <li>- to guarantee the state will assume responsibility for decommissioning, handling of RAW from decommissioning and for long-term storage of SNF,</li> <li>- to guarantee the amendment to the Act shall establish safe manner of handing over the nuclear installations by operator to organization authorized by state for purposes of decommissioning thereof,</li> <li>- to guarantee the level of contributions and payments to the NNF shall be determined by independent body (NNF), pursuant to imposed legislative procedures,</li> <li>- to guarantee beneficiary of financial resources of the NNF shall submit eligible costs data to the NNF in scope and terms set by legislation,</li> <li>- to guarantee scope and structure of eligible costs for activities in ZČJE, shall be defined in legislation,</li> <li>- to guarantee operator of non-reactor nuclear installations shall make payments to the NNF for the purposes of financing of decommissioning thereof.</li> </ul>	2016	MH SR

Proposal of new Act on the National Nuclear Fund was submitted to the Board Meeting (BM) of the Ministry of Economy of the SR in April 2017. Based on comments of the Union of Employers of Power Industry in Slovakia specified in the letter of the Federation of employers' associations of the Slovak Republic dated 25 May 2017, concerning the amount of levies of obliged entities payable to the National Nuclear Fund pursuant to proposal of the new Act on the NNF, related proposal of the Government Decree and concerning baseline data for determining thereof, the approval of the Act was interrupted, after preliminary comments proceedings. Therefore, working

Seq. No.	Measure	Deadline	Responsible
	<p>group was renewed consisting of representatives of all interested parties in order to approve jointly input parameters and procedure for fixing of the amount of compulsory contributions and compulsory payments to the NNF.</p> <p>Accepted procedure required that activity of working group for preparation of the Act will be renewed, contradictions concerning determination of level of compulsory contributions to the NNF will be removed and procedure for determination of level of compulsory contributions for reactor installations as well as compulsory payments for non-reactor installations under the proposal of the Government Decree will be mutually agreed. Therefore, this Act was included in the agenda of plan for legislative tasks of the Government of the SR for the year 2018 with the date for submission to negotiation of the Government of the SR until 30 September 2018. Elaboration and mutual agreement of the document “Methodology for determination of compulsory contributions for reactor nuclear installations and compulsory payments for non-reactor nuclear installations to the NNF” took place in 2018 within a timetable of working group for preparation of this Act. The Document included calculation of the level of compulsory contributions and compulsory payments reflected in proposal of the Government Decree as an implementing rule to this Act. At the same time working group modified wording of the Act and related documents were completed for legislative process.</p> <p>After transmissions of documents to MH SR and completion thereof within internal comments proceedings, observations were expressed following interdepartmental comments proceedings, from which principal observations were discussed within resolution observation procedure. Consequently, text of the Act and related documents was completed or modified. Facts arising under the Act No. 87/2018 Coll. on Radiation Protection, entered into the force on 1 April 2018, were integrated into wording of the Act. The Act on the NNF was enacted by the National Council of the Slovak Republic in October 2018 and after signature of the President was published in the Collection of Laws in November 2018 under the number 308/2018 with effect from 1 January 2019. Subsequently, endorsement process and completion of the Government Decree on Compulsory contributions and compulsory payments, the Government Decree on Deliveries from electricity price delivered to end users and the Regulation of MH SR on Eligible costs and price calculations of internal processes took place, as an implementing rules to this Act with expected entry into force by 1 February 2019 (15 February 2019 respectively).</p> <p>New Act on the NNF provides for a duty to pay funds (compulsory payments) also from operating non-reactor NI. The amount of compulsory contributions and compulsory payments is established based on approved methodology resulting from determined financial need for decommissioning of NI. Above mentioned partial objectives of this new Law were achieved thereby. Further partial objectives concerning responsibilities and procedures in handling of RAW were integrated into new Law in form of amendment points of the Act 541/2004 Coll. (the Atomic Act).</p> <p>Subject matter of a new Act on the NNF are provisions relating to eligible costs and financial resources of the NNF provided to applicants including price calculations for internal processes evaluation, which was reflected to successive Regulation of MH SR No. 31/2019 Coll.</p> <p><u>The task is completed.</u></p>		

Seq. No.	Measure	Deadline	Responsible
<b>In the area of decommissioning of nuclear installations</b>			
2.	To complete the Stage II of NPP A1 decommissioning	2016	JAVYS, a. s.
<u>The task is completed.</u>			
3.	To implement further stages of NPP A1 decommissioning	2033	JAVYS, a. s.
<p>The Stage III and IV of decommissioning has been executed from 1 January 2017 in continual process of NPP A1 decommissioning with the planned completion in 2024. Based on the Decision of NRA SR No. 369/2016, permission for implementation of the Stage III and IV was released in scope specified in document “The Plan of the Stage III and IV for NPP A1 decommissioning” and also in relation to document “The Plan for handling and transport of RAW and the plan for handling of conventional waste from the Stage III and IV of NPP A1 decommissioning”. Subsequent Stage V of decommissioning is projected for the period 2025 – 2033.</p> <p>Main subject of the Stage III and IV is decommissioning of technological installations of gas management, management of heavy water, management of cooling water of primary circuit, systems for emergency discharge of steam generators and relief valves of steam generators, 2 pieces of steam generators, oil management of turbocompressors, system for fuel cladding, systems of dosimetry control, liquid leakage detecting and disconnected air ventilation systems. In parallel with activities of NPP A1 technological installations decommissioning, ongoing process for casings processing for long-term storage of SNF, processing of historical liquid radioactive waste used as cooling medium for SNF storage (chrompik III - aqueous solution of chromium and potassium dichromate <math>K_2Cr_2O_7</math>), processing of sludge layers resulting from long term storage of SNF and sludge layers from outer tanks originally used for storage of liquid RAW from NPP A1, as well as process of handling with contaminated soils and concrete and contaminated groundwater remediation is under way. In parallel with all activities, monitoring, processing and conditioning of RAW from NPP A1 decommissioning, their transport and subsequent disposal in NR RAW in Mochovce is ongoing. Radioactive waste, which does not meet criteria for disposal in NR RAW in Mochovce is stored in installations and premises constructed for this purpose until their final disposal in Deep repository.</p> <p>Following key activities were executed in NPP A1 decommissioning in 2018:</p> <ul style="list-style-type: none"> <li>• development of implementation and safety documentation for individual subjects of decommissioning,</li> <li>• implementation of technological installations decommissioning of sectional plumbing fixtures in PC in the rooms No. 505 and 514 in the object 30,</li> <li>• implementation of decontamination, dismantling of <math>D_2O</math> and <math>CO_2</math> technological installations and treatment of construction surfaces in the rooms No. 104, 106, 107, 238 and 240 in the object 30,</li> <li>• implementation of decontamination and dismantling of <math>CO_2</math> gas management technological installations in the room No. 113 in the object 30,</li> </ul>			

Seq. No.	Measure	Deadline	Responsible
	<ul style="list-style-type: none"> <li>• implementation of decontamination and dismantling of technological installations for fuel cladding inspection (KGO), dosimetry control, pipeline and cable systems in the rooms No. 200 – 215, 231, 302 and 303, 300 and 301 in the object 30,</li> <li>• implementation of decontamination of outer surfaces of technology, walls and floors in the room No. 60, decontamination of pipe sections of special channels in active pipe channel in the room No. 47 and the object 32,</li> <li>• implementation of decommissioning of not operated installations at the floor level -5,5 m in the object 32,</li> <li>• implementation of technological installations decommissioning of emergency relief valves and distribution steam pipeline from steam generators, distribution pipeline systems for water supply and other related equipment and treatment of construction surfaces in the rooms No. 116 – 123 in the object 32 and the rooms No. 205, 206, 207, 208, 210, and 211 in the object 32,</li> <li>• implementation of decontamination and dismantling of technological installations of turbocompressors oil management and treatment of construction surfaces in the rooms No. 24 – 29 in the object 32,</li> <li>• implementation of technological installations decommissioning in the rooms No. 202, 203, 204 in the object 32, pipeline sections connected to relief valves of steam generators on the roof of the object 32,</li> <li>• implementation of technological installations decommissioning in the rooms No. 35, 39, 40, 57, 64, in corridor No. 38 and 76 in the object 28 and technological systems decommissioning at the floor level -4,00 m in the object 28,</li> <li>• decontamination and fragmentation of 28 pieces of casings of long-term storage of SNF,</li> <li>• decontamination of 5 tanks of oil management in the object 44/20,</li> <li>• decommissioning of pipeline air ventilation channel among the objects 41, 44/10 and 44/20,</li> <li>• processing of 2 m<sup>3</sup> of cooling medium chrompik III by vitrification, processing of sludge layers resulting from long-term store of SNF in the object 30 and sludge layers from outer tanks,</li> <li>• monitoring of radiation situation in the process of decommissioning of rooms, installations and technological systems in the objects 28, 30, 32 and outer objects,</li> <li>• monitoring, classification, packaging and transport of contaminated soils for disposal in NR RAW,</li> <li>• monitoring, classification, decontamination, packaging and transport of contaminated concrete for disposal in NR RAW,</li> <li>• supporting and development works for handling with specific types of RAW (chrompik III with scattered dowerm and sludge layers, RAW waste treatment products stored in casings of long-term storage and in certified storages),</li> <li>• continual monitoring of groundwater and infiltration groundwater and monitoring of NPP A1 decommissioning effect on environment at the site of NPP A1.</li> </ul>		
	Works were executed and coordinated in accordance with the document “Plan for the Stage III		



Seq. No.	Measure	Deadline	Responsible
	and IV of NPP A1 decommissioning”. Continual monitoring of progress in decommissioning project took place at regular monthly meetings of project management and at subsequent meetings of management of JAVYS, a. s.		
	<u>The task is under way.</u>		
4.	To implement the Stage II of NPP V1 decommissioning	2025	JAVYS, a. s.

Implementation of the Stage II of NPP V1 decommissioning started on 1 January 2015 based on the Decision of NRA SR 900/2014 issued on 23 December 2014. NPP V1 decommissioning is under way in form of subprojects embracing all activities necessary for achievement of defined objective – “brown field”, i. e. release of the site for industrial deployment until 31 December 2025.

Projects implemented in 2018 are listed in the Figure No. 1.

**Figure No. 1: Projects implemented in 2018 in NPP V1 decommissioning**

Project No.	Title of the project	Status of the project
A1.8	PMU Consultant (the Stage 8)	completed
A1.9	PMU Consultant (the Stage 9)	preparation
A5-A2	Change of electrical supply system of JAVYS after final shutdown of NPP V1	preparation
A5-A3	Optimization of electrical scheme	completed
B6.6A	Measurements for decommissioning support	implementation
C7-A4	Facility for remelting of metallic RAW	extended
C9.4	Proposal for building of new disposal structures for LLW and VLLW from NPP V1 decommissioning in NR RAW Mochovce	Completed in 2018
C15-A	Integrated computer system for NPP V1 decommissioning logistics	completed
D0	Implementation of decommissioning programme utilizing human resources available in NPP V1 Bohunice	implementation
D2-A	Decontamination of PC (primary circuit) – the Stage II	Implementation time (until 26

Seq. No.	Measure	Deadline	Responsible
		February 2018)	
D2.1	Decontamination of storage pools and other contaminated tanks of NPP V1 – part 1	completed	
D3.1B	Dismantling and demolition of cooling towers of NPP V1	completed	
D4.1	Modification of power plant and installation of new facilities	implementation	
D4.2	Dismantling of large system components of primary circuit	implementation	
D4.4A	Dismantling of systems of auxiliary building – the Stage I	completed	
D4.4A1	Modification of facilities in Physical Area Protection and Barrier System (AKOBOJE)	implementation	
D4.4B	Dismantling of systems in controlled area of NPP V1 – part 1	implementation	
D4.4C	Dismantling of systems in controlled area of NPP V1 – part 2	preparation	
D19.1	Innovation of hardware equipment of PMU	completed	
D4.7	Merged activities D4.5, D4.6 and D4.7 Decontamination and demolition of NPP V1 objects and restoration of NPP V1 area	preparation	
D6.2	Final monitoring and release of the site for industry deployment	planning	

Significant project D3.1B „Dismantling and demolition of cooling towers of NPP V1“, was completed in 2018. Outcome of this project can be seen in release of a land under outer NPP V1 objects for further unrestricted use.

One of the key projects for achievement of final stage is implementation of the project D4.2 „Dismantling of large system components of primary circuit“, primary purpose of which is dismantling the most contaminated facilities (reactor pressure vessels of both units, steam generators, main circulation pumps, pipelines of primary circuit and other technological components) and linings in areas of controlled area of primary circuit of NPP V1 main production unit. Running in parallel, there is ongoing implementation of D4.4B project „Dismantling of systems in controlled area of NPP V1 – part 1” and other projects relating thereto. Date of commencement of the project D4.4C.01 “Dismantling of systems in controlled area of NPP V1 – part 2” is envisaged in 2019. Aforementioned projects are deemed to be the most important from the perspective of ensuring continuity of NPP V1 decommissioning and transition into final

Seq. No.	Measure	Deadline	Responsible
	<p>decommissioning stage.</p> <p>Implementation of NPP V1 decommissioning is undertaken in conformity with the approved plan of the Stage II with slight delay in some projects concerning timetable of 2014. Longer delay occurred in project C7-A4 “Facility for remelting of metallic RAW”, completion of which was shifted from 2018 to 2019 by amendment to the contract presumably without affecting overall timetable of NPP V1 decommissioning. This project significance of which extends beyond NPP V1 decommissioning is financed predominantly (81%) by national funds (NNF). As a consequence, this outcome will be also exploited by other nuclear installation decommissioning projects.</p> <p>Simultaneously with dismantling activities there is a continual process under way concerning handling with radioactive waste generated, their transport and release of materials meeting the criteria for their release into the environment. Overall progress with individual projects included is monitored continually via monthly and also semiannual reports and meetings of managers of respective BIDSF projects, representatives of consultant and EBRD. In addition to this, semiannual monitoring committee meetings have been taken place with the participation of JAVYS, a. s., SIEA, NNF, MH SR, and representative of EBRD and the EC.</p> <p>Implementation of the Stage II NPP V1 decommissioning is to a significant degree contingent upon complex financial management of this process. For successful course of decommissioning projects, adequate funding from BIDSF, SIEA and national (i. e. Slovak) financial resources of NNF are expected. Updated detailed plan for NPP V1 decommissioning was elaborated in 2018, containing breakdown of total costs and methods of the coverage thereof.</p> <p>On the basis of NPP V1 decommissioning state, planed future activities status and in spite of the abovementioned indicated delay it is envisaged, primary purpose of NPP V1 decommissioning will be attained until the end of 2025. Progress in respective projects and total progress is foreseen in line with the projection, pursuant to the indicated updated detailed plan for NPP V1 decommissioning.</p> <p><u>The task is under way.</u></p>		
5.	Maximum use of financial resources from BIDSF for NPP V1 decommissioning projects	2025	JAVYS, a. s.
	<p>Effectivity of BIDSF use in NPP V1 decommissioning is monitored pursuant to project management procedures for NPP V1 decommissioning and monitored via regular monthly reports and reports for NPP V1 decommissioning monitoring committee conducted semiannually.</p> <p>NPP V1 decommissioning financing is comprised of two resources – resources of EU and national resources of SR. Financial resources of EU are preferably used in implementation of projects. Out of total number of 74 NPP V1 decommissioning projects, 69 projects were predominantly funded through the EU resources. National resources of the SR are for the most part used for activities connected with incurred supporting costs, associated with implementation of decommissioning projects, considerations of projects and co-financing, for management of maintenance and repairs of objects, handling with RAW including disposal and for storage of</p>		

Seq. No.	Measure	Deadline	Responsible
SNF.	<p>23 Grant agreements were approved by EBRD for an amount of EURO 556 million to date 31 December 2018. Cumulative amount of EUR 306 million was withdrawn for NPP V1 implementation decommissioning projects to date 31 December 2018 under the agreements. Amount of non-guaranteed EU funds corresponds to EUR 115 million to date 31 December 2018.</p> <p>Total estimated costs for NPP V1 decommissioning (stated at the price level of 2018) amounting to EUR 1 237 million, whereby the sum of EUR 671 million shall be reimbursed by EU (EBRD and SIEA).</p> <p><u>The task is under way.</u></p>		
6.	To prepare decommissioning of other NI	permanently	JAVYS, a. s. SE, a. s.
	<p>Procedures, timetables and the costs for decommissioning of other NI are given in the conceptual plans for decommissioning of respective nuclear installations from operation, developed in line with the requirements under the Act No. 541/2004 Coll. on the Peaceful Use of Nuclear Energy and amending and supplementing certain acts and the Decree of NRA SR No. 58/2006 Coll. Decommissioning plans of NI other than installations for generating electricity (installations which are subject to compulsory payment obligation under the new Act on NNF No. 308/2018 Coll. to ensure financing for decommissioning thereof) are subject of monitoring from the view of verification of input parameters and optimization of technical and economic data. This applies also to NI TSÚ RAW from the perspective of reclassifying of NPP A1 and NPP V1 particular objects into this NI, becomes the subject of discussions, primarily from the light of cost optimization for decommissioning of such objects.</p> <p>Conceptual plans for decommissioning of NPP EBO V2 and NPP EMO 1, 2, were updated on account of updating database of NPP facilities in 2017, what represents one of primary inputs for establishing costs for NI decommissioning under ISDC structure. These conceptual plans for decommissioning were elaborated in variant for 60 years of operating life for NPP V2 and NPP EMO 1, 2, what corresponds to the year 2045 for shutdown of NPP V2 and the year 2061 for NPP EMO 1, 2. These updated conceptual plans for decommissioning supplemented by statement on comparison to variant for NPP operating life for 40 year were reviewed by NRA SR in 2018. NRA SR issued Decision No. 246/2018 thereto in form of consent for change implementation in documentation reviewed by the Authority.</p> <p><b>It should however, be noted that real operating life of nuclear installation is contingent upon successful demonstration of its safe state throughout periodical assessment of nuclear safety. Rules and time limits of this process is defined by legislation. The question whether it is actually possible to operate NI for 60 years period from the technical view, will become only clear from results of the last periodical assessment, which will precede this period. Variant with 60 years of operation considered in this context in conceptual plans for decommissioning, represents only basis for establishing the level of contamination of</b></p>		

Seq. No.	Measure	Deadline	Responsible
<p><b>facilities, estimated quantity of generated fuel and radioactive waste and subsequent calculation of necessary financial resources for decommissioning.</b></p> <p><u>The task is under way.</u></p>			
<p><b>In the area of management of the radioactive waste and the spent nuclear fuel in general</b></p>			
7.	To build and commission Integral Storage Facility for RAW in Jaslovské Bohunice	2018	JAVYS, a. s.
<p>Construction of Integral Storage Facility for RAW was completed in 2017 and commissioning was executed based on Decision of NRA SR of 10 October 2017. Building permit and permit for bringing the object into use were issued.</p> <p><u>The task is completed.</u></p>			
8.	To build new storage capacities of SNF	2020	JAVYS, a. s.
<p>In the area of preparation and building of new storage capacities for SNF in conformity with the Opinion of MŽP SR 1064/2016-3.4/hp to proposed activity „Completion of storage capacity for SNF in locality of Jaslovské Bohunice“, project activities connected to construction of dry storage for SNF were implemented in 2018 in following extend:</p> <ol style="list-style-type: none"> <li>1. Development of the project for building permit in scope of implementation project for building object 841M.</li> <li>2. Safety analysis and tests.</li> <li>3. Development of the project for building permit in scope of implementation project Physical area protection system.</li> <li>4. Compiling a dossier, accompanying Notification pursuant to Article 37 of EURATOM TREATY.</li> </ol> <p>In addition, based on decisions adopted, replacement of utility networks necessary for construction of new storage capacities of SNF and completing replacement of points relating to parts of nitrogen object and of section of pipeline channel SO 401 M have been carried out.</p> <p>Completion of implementation of storage capacities of SNF is projected in 2021.</p> <p><u>The task is under way.</u></p>			
9.	To establish database of all radioactive waste from NI in SR and ensure its continual updating	2016	JAVYS, a. s. in coordination with MH SR and competent supervisory

Seq. No.	Measure	Deadline	Responsible
			authorities
<u>The task is completed.</u>			
10.	To construct Facility for remelting of metallic radioactive waste	2018	JAVYS, a. s.
<p>The authorization for construction for Facility for remelting of metallic RAW, preparation for implementation of which started in 2016, was issued in December 2017.</p> <p>The investment activity is implemented within the projects for NPP V1 decommissioning (C7-A4) with the coverage of 19% funding from BIDSF and 81% from the NNF and JAVYS, a. s. Finalization including tests was expected until the end of 2018.</p> <p>Processing of project documentation related to supplier, respectively to producer of melting furnace itself took place in 2018. Contract was concluded in 03/2018. Construction modifications took place in the object 34 NPP A1 in premises for installation of equipment for remelting. Main technological equipment was produced and delivered, supporting systems included. Sole installation at place started in December 2018. Documentation for approval for construction was developed and submitted to NRA SR and documentation for commissioning was developed. Commissioning is expected in 07/2019 (original deadline was 12/2018).</p> <p><u>The task is under way with delay of 7 months</u></p>			
11.	To construct and commission Facility for handling with IRAW and Captured Radioactive Material	2016	JAVYS, a. s.
<u>The task is completed.</u>			
<b>In the area of disposal of the radioactive waste and the spent nuclear fuel</b>			
12.	To construct Repository for Very-Low Level radioactive waste	2018	JAVYS, a. s.
<p>The first module for Very Low-Level Waste for VLLW from NPP A1 constituting a part of the NR RAW was commissioned in 06/2016. Construction of the second module of disposal places for VLLW from NPP V1 took place within BIDSF project C9.4 in 2017. The second module (disposal space with system of barriers ready for the coverage by sliding shelter) was completed in September 2017 and was handed over to the operator of NR RAW after test procedures in October. Inspection took place and the building permit was issued in December 2017.</p> <p><u>The task was completed in 2017 and the installation is in operation.</u></p> <p>Note: Works on the coverage of the first module of VLLW and relocation of hall for the coverage of the second module of repository of VLLW have been started at the end of 2018.</p>			
13.	To construct other disposal structure after filling of the second double row of NR RAW	2018	JAVYS, a. s.
Construction of disposal boxes, tunnels, control shafts, steel hall and assembly of technological			

Seq. No.	Measure	Deadline	Responsible
	<p>systems of the third double row of LLW repository including gantry crane, wiring and cabling was in progress under the project C9.4.</p> <p>Construction was completed by successful execution of relevant inspections and handed over to JAVYS, a. s. assets in November 2018. Dossier of real work performed and dossier for procedure for authorization for its use is expected in the first quarter of 2019.</p> <p><u>The task is completed.</u></p>		
14.	<p>To adopt decision on continuation or withdrawal of twin approach in development of deep disposal – comprehensive assessment of the idea of joint international deep repository</p>	2020	MH SR
	<p>One of two alternative for addressing the Final Stage of Fuel Cycle in the National Policy for Management of SNF and RAW in SR envisages international deep repository. Working group ERDO as an outcome of SAPPIER project supported by EC with active participation of Slovakia was established in 2009. Its objective is to verify feasibility of shared repository in Europe. Slovakia has not become the member of group ERDO and also has not so far actively participated at its meetings.</p> <p>All preparatory and conceptual works executed in the area of Deep Repository in 2018 were focused on the development of „own“ DR in SR.</p> <p>NNF joined the research project EC EURAD („European Joint Programme on Radioactive Waste Management“) within work package ROUTES (“Waste management routes in Europe from cradle to grave”) with objective to participate more actively in activities connected also to shared solution for management of waste. „Shared solutions in European countries“ is one of the objectives to be researched. The project will be addressed after endorsement of European Commission in 2019 - 2024.</p> <p>While none of alternatives for solution to deep disposal in SR has not been researched adequately so far, the decision on twin approach is recommended to be postponed for the next years. Such decision must be preceded by detailed expert analysis of both alternatives.</p> <p>As indicated in 2.4.5. of the Report on Implementation of the National Programme for 2016, the final decision on siting of Deep Repository in SR will be possible to adopt until the end of 2030 and the idea of international deep repository still remains one of open possibilities for SR.</p> <p><u>The task is under way.</u></p>		
15.	<p>To elaborate plan for further stages of renewed development of deep disposal</p>	2016	JAVYS, a. s.
	<p>Execution of the project „Deep Repository – locality selection the stage 1“, part of which is also proposal for further progress in development of DR in SR was completed in 2016.</p> <p>In this context the task was evaluated as <b><u>completed</u></b> to date 31 December 2016.</p> <p>Note: Based on elaboration of detailed plan for research and development and elaboration of the</p>		

Seq. No.	Measure	Deadline	Responsible
<p>project of geological task in the Stage 2 of execution, the plan for development of DR was updated in 2018 and is included in the final report of the task (B.4), described in detailed in the point 16 below.</p>			
16.	To decide on siting of Deep Repository of SR (in case of termination of twin approach)	2030	JAVYS, a. s.
<p>Programme for development of DR continued in execution of the project „Deep Repository – locality selection, the Stage 2 – part I“ in 2017-2018. Following documents were developed by consortium of suppliers:</p> <p>B.1 Project of geological task</p> <p>B.2 Framework programme for development and research in the area of deep disposal included implementation requirements.</p> <p>B.3 Proposal for implementation of system for economic stimulation of localities affected by development and operation of Deep Repository.</p> <p>B.4 Final report of the task.</p> <p><b>B.1 Project for geological task (GÚ)</b> – pursuant to the Act No. 569/2007 Coll. on geological works (geological Law) as amended and the Decree No. 51/2008 Coll. implementing geological law as amended addresses proposal and design of relevant geological and technical works for two selected prospective localities for disposal of the spent nuclear fuel and the High-level radioactive waste in SR: „Tribeč“ and „Western part of Rimava basin“. Project GÚ involves definitions of projected geologic works and methods, with indication of the scope and the way of applications thereof. Project preparation of drilling works includes analysis of possibilities and selection of potentially appropriate places for drilling works implementation.</p> <p><b>B.4 Final report</b> comprises of three parts:</p> <p>B.4.1 Summary of results for outcomes within the project IPR I00TUND20008 „Deep Repository – locality selection the Stage 2 – part 1“.</p> <p>B.4.2 Plan of works for the years 2019 -2024 in the area of development of DR in SR</p> <p>B.4.3 Proposal for process (detailed technical specification) for selection of general supplier for implementation of tasks arising from the plan of works for the years 2019 - 2024 for the project „Deep Repository – locality selection the Stage 2 – part 2“ in conformity with the Act No. 343/2015 Coll. On Public Procurement as amended.</p> <p>JAVYS, a. s. will organize a tender for selection of general supplier for implementation of activities in locality selection (geological activities, terrain and surveying works in selected localities, safety demonstration, support for public participation etc.) in subsequent period with intention to decide finally on siting of Deep Repository in SR until 2030.</p> <p><u>The task is under way.</u></p>			
17.	To commission Deep Repository	≈ 2065	JAVYS, a. s.



Seq. No.	Measure	Deadline	Responsible
<p>Implementation of the project „Deep Repository – locality selection the Stage 1“ completed in 2016 and implementation of the project „Deep Repository – locality selection the Stage2 – part I“, which were in progress in 2017-2018, should ensure basic conditions to define steps for selection of locality for construction of DR in SR in order to ensure construction and commissioning of DR in SR until 2065.</p> <p><u>The task is in progress.</u></p>			
<p><b>In the area of research and development</b></p>			
18.	To develop Framework Programme for development and research in the area of deep disposal and set internal conditions for its implementation.	2018	JAVYS, a. s.
<p>Document B.2 Framework Programme for development and research in the area of deep disposal was elaborated within implementation of the project „Deep Repository – locality selection the Stage 2 - part I“, which was in progress during 2017 – 2018. <b>Framework Programme for development and research</b> was described in detail for all stages and areas of development of DR. Whole process until stage of repository closure is planned practically for at least 100 years. Therefore, it was possible to describe in detail especially activities for the next 15 - 20 years (locality selection stage). Activities in longer time may be expected only in general terms and it is possible they will be performed in other form and under other conditions (e. g. legislative) than existing assumptions. Significant part of the document forms proposal for Programme for maintenance of educational level. Concise overview of potential fields of cooperation between Czech and Slovak Programme for development of DR was developed in the field of science, research and development.</p> <p><u>The task concerning development of Framework Programme for development and research is <b>completed</b>, the part for presenting internal conditions setting for implementation of this framework programme remains in monitoring.</u></p>			
<p><b>In the area of transparency</b></p>			
19.	<p>To develop and prepare implementation of system for economic stimulation of localities affected by development and operation of repositories</p> <p>To focus exclusively on economic stimulation of localities is not adequate. A comprehensive system for information and public relations for the long term should be established.</p>	2018	<p>MH SR, JAVYS, a. s.</p> <p>National Nuclear Fund</p>
<p>Document <b>B.3 Proposal for implementation of the System for economic stimulation of localities affected by development and operation of Deep Repository</b>, arising from recommendations for public relations elaborated in the Stage 1 of the project DR – locality selection, was developed within implementation of the project „Deep Repository – locality selection the Stage 2 – part I“ in 2017 -2018.</p>			

Seq. No.	Measure	Deadline	Responsible
	<p>Proposal for economic stimulation of affected localities is analyzed in detail in the document in three variants. They are described in detail into complete wording of proposals for Government Decrees including related supported documents. Basic variant 0 addresses stimulation from the stage, when main and backup locality (i.e. after completion of EIA process) is selected. Proposal for the system of stimulation of municipalities in the first variant in addition to above mentioned contributions, assumes direct contributions to municipalities, in which territory defined researched area is located under project of geological task. In the second – extension variant the system of economic stimulation is considered to be comprehensive stimulation tool for support of participation of affected municipalities in all five prospective localities in all stages of development of DR from the locality selection until the closure of repository. Time table and sequence of individual steps including responsibilities for implementation were also described in the document in detail. In addition to proposal for stimulation, the document also contains conditions and recommendations for the area of public participation, which is of vital importance in the locality selection decision process.</p> <p>The task concerning development of the proposal for economic stimulation is evaluated as <b>completed</b>. The part concerning establishment of comprehensive system for information and public relations for the long term is completed only partially based on documents elaborated in 2016. Therefore, it is still under way (see Chapter 5 of this Report).</p>		

### 3. Management of RAW

Overview data of RAW for previous evaluation included in the Implementation Report of the National Programme for the period until 31 December 2017 are indicated in division under individual areas of management of RAW.

#### **3.1 Overview of generation and recording of RAW**

Following quantities of RAW from implemented activities of decommissioning and operation of individual NI were transferred to company JAVYS, a .s. for processing for the period from previous evaluation of implementation of the National Programme for management of the spent nuclear fuel and the radioactive waste i. e. for 2018.

##### **3.1.1 Decommissioning of NPP A1:**

- liquid radioactive waste: 707,46 m<sup>3</sup>,
- combustible solid radioactive waste: 22,311 t,
- compressible solid radioactive waste: 139,682 t,
- metallic RAW intended for remelting: 250,908 t,
- other solid radioactive waste (fixed ra-sludges in matrix, etc.): 134,544 m<sup>3</sup>,
- contaminated soils: 1445,1 m<sup>3</sup>,
- contaminated concrete: 173,4 m<sup>3</sup>,
- contaminated used filtration cartridges of air-technical systems: 3,314 t.

##### **3.1.2 Decommissioning of NPP V1:**

- liquid radioactive waste: 12,02 m<sup>3</sup>,

- combustible solid radioactive waste: 5,452 t,
- compressible solid radioactive waste: 72,938 t,
- metallic RAW: 253,386 t,
- contaminated used filtration cartridges of air-technical systems: 3,0305 t.

**3.1.3 Following quantities of RAW from operation of NPP V2 and NPP EMO1, 2 were transferred by company SE, a. s. for further handling in JAVYS, a. s.:**

- liquid radioactive waste – concentrates: 35,1 m<sup>3</sup>,
- liquid radioactive waste – exchange resins: 47,566 m<sup>3</sup>,
- solid radioactive waste – combustible: 30,098 t,
- solid radioactive waste – compressible: 33,584 t.

RAW generated in NPP A1 decommissioning process were continuously processed at TSÚ RAW processing lines and soils and contaminated concrete at designed work places in conformity with the plan for flows of RAW for 2018. Final product-filled FCC and filled high-volume bags and drums of VLLW were continuously disposed in NR RAW. Therefore, no new inventories requiring temporary storage (with exception to metals intended for remelting) were accumulated generally. In comparison with expected quantities of RAW from NPP A1 decommissioning indicated in document Plan for Stages III and IV of NPP A1 decommissioning, real quantities of RAW generated are currently less than expected.

RAW quantities generated in NPP V1 decommissioning process were less than expected in 2018, primarily because of project D4.2 work status in main components of primary circuit dismantling, in which intensity of own dismantling works has not yet reached the level expected originally. Quantities of RAW from NPP V1 were continuously processed at TSÚ RAW processing technology lines with no need for storage (with exception to metals intended for remelting).

Processing and conditioning of RAW

**3.1.4 Following activities in handling of RAW were implemented in NI TSÚ RAW:**

- incineration of RAW – by incineration was processed:
  - 35,436 t SRAW from NI decommissioning,
  - 30,097 t SRAW from NI operation,
  - 2,06 m<sup>3</sup> combustible LRAW and spent sorbents from NI decommissioning,
  - 10,174 m<sup>3</sup> combustible LRAW and spent sorbents from NI operation,
- high-compressed compression of SRAW – by high-compressed compression was processed:
  - 339,674 t of compressible SRAW from NI decommissioning,
  - 47,621 t of compressible SRAW from NI operation,
- cementation of RAW – by cementation into FCC was conditioned:
  - 302,841 m<sup>3</sup> SRAW from NI decommissioning,
  - 30,1 m<sup>3</sup> SRAW from NI operation,
  - 185,221 m<sup>3</sup> LRAW from decommissioning,
  - 68,286 m<sup>3</sup> LRAW from NI operation,

- by fragmentation was processed:
  - 266,159 t of metallic RAW from NI decommissioning,
  - 24,827 t from NI operation,
- by decontamination was processed:
  - 217,533 t of metallic RAW from NI decommissioning,
  - 16,199 t from NI operation.

### 3.1.5 Following quantities of RAW were used in specialized technology facilities of JAVYS, a. s. :

- vitrification of chrompik:
  - 2 m<sup>3</sup> of chrompik III were processed,
- handling with contaminated concrete:
  - 173,4 t of contaminated concrete were processed,
- fragmentation of casings of Long-term storage:
  - 28 pieces of PDS were processed,
- fixation of sludges:
  - 33,81 m<sup>3</sup> ra-sludges were fixed into cement matrix from N1/2 tank of object 44/10 in ZFK facility and 3,806 m<sup>3</sup> ra-sludges were fixed from NPN 2 tank in SUZA II facility.

### 3.1.6 In NI FS LRAW JAVYS, a. s. in Mochovce was primarily

- By bituminization of spent sorbents and by cementation processed and conditioned:
  - 34,034 m<sup>3</sup> of RAW from NI decommissioning,
  - 81,448 m<sup>3</sup> of LRAW from NI NPP EMO 1, 2 operation.

Processing of RAW at technology lines of TSÚ RAW and FS LRAW was implemented in line with the plan of RAW flows in 2018. Capacities of processing lines were adequate, coordination of individual processes and relations including transports and disposal in NR RAW were in conformity with JAVYS, a. s. plan. Processing of RAW from SE, a. s. was executed in conformity with the contract.

Special kinds of RAW, e. g. chrompik, sludges from DS, casings of DS and other RAW from NPP A1 were processed in line with the scheduled plan and RAW flows in conformity with the time table of NPP A1 decommissioning project. It is assumed, these quantities will be continuously processed within expected terms, although for some RAW e. g. sludges from chrompik, defining optimal procedure for fixation thereof has been yet subject for further development.

## 3.2 Storage of RAW

### 3.2.1 Storage in NI TSÚ RAW JAVYS, a. s.

Following quantities of RAW were stored in certified storages of RAW, located at NI TSÚ RAW JAVYS, a. s. site to date 31 December 2018:

Object	Room number	Filling status (200 dm <sup>3</sup> drum)	Filling status (%)	Storage capacity (200 dm <sup>3</sup> drum)

32	30/54	3248	87,2	3724
32	97	1625	79,3	2050
32	106	1344	90,8	1480
34	1	2824	98,7	2860
723	-	660	82,5	800
<b>Object</b>	<b>Room number</b>	<b>Filling status (m<sup>2</sup>)</b>	<b>Filling status (%)</b>	<b>Storage capacity (m<sup>2</sup>)</b>
641	-	695*	27,7	2506**

\* 3236 drums 200 litres of RAW, 336 drums 220 l of RAW, 219 containers 2EM-01 of RAW.

\*\* Maximum area coverage, i. e. combination of package forms of RAW and freely disposed radioactive materials.

Out of total quantity of RAW stored in certified storages of RAW, 7064 pieces of drums are intended for remelting and 9 pieces of package forms is not disposable in NR RAW.

### 3.2.2 Storage in SE a. s.

To date 31 December 2018 following quantities were stored in NPP V2 storages:

- 86,2 t SRAW,
- 1564,1 m<sup>3</sup> concentrates,
- 117,8 m<sup>3</sup> ion exchangers.

To date 31 December 2018 following quantities were stored in EMO 1, 2:

- 9,497 t SRAW,
- 1130,6 m<sup>3</sup> concentrates,
- 34,2 m<sup>3</sup> ion exchangers.

Storage capacities of SE, a. s. are adequate in regard to continuous transfer of RAW for processing. As filling status in certified storages in TSÚ RAW installation in JAVYS, a. s. demonstrates, available capacity suggests need for metallic RAW processing in facility designed for remelting. On the other hand, coordination of handling processes with materials from NPP A1 and NPP V1 decommissioning is necessary to avoid temporary storage. In parallel it will be necessary to develop more comprehensive analysis included also real possibilities for building new storage spaces.

Integral storage was used only in minimal scope in 2018. Filling status of storage capacities did not constitute limiting factor for decommissioning work progress.

## 3.3 Disposal of RAW

### 3.3.1 Disposal of FCC in NI NR RAW Mochovce

- to date 31 December 2018 in total of 5474 pieces of FCC from decommissioning and from operation of NI were disposed in National Repository RAW, whereby 316 pieces of FCC were transported and subsequently disposed in this installation for the year 2018.

### **3.3.2 Disposal to VLLW repository**

- For the year 2018 quantity of 4050,31 m<sup>3</sup> of VLLW from NPP A1 decommissioning and 134,57 m<sup>3</sup> from NPP V1 decommissioning were disposed to this installation (1. disposal module with capacity of 20 000 m<sup>3</sup>).

## **4. Management of SNF**

Activities connected with SNF management are reviewed from the period of previous review of the National Programme implementation until 31 December 2018.

### **4.1 Transfer of SNF for storage**

Following quantities of SNF from NPP V2 and NPP EMO 1, 2 operation, were transferred by company SE, a. s. for the long-term storage in NI ISFS for the period from the previous review of the National Programme implementation, thus for the year 2018:

- the spent nuclear fuel from NPP V2 operation: 188 pieces,
- the spent nuclear fuel from NPP EMO 1, 2 operation: 144 pieces.

### **4.2 Storage of SNF**

To date 31 December 2018, 12 374 pieces of fuel assemblies of SNF were stored, in NI ISFS out of which:

- 5143 pieces from NPP V1,
- 5167 pieces from NPP V2,
- 2064 pieces from NPP EMO 1, 2.

## **5. Development of Deep Repository**

Program for development of DR continued in project implementation „Deep Repository – locality selection the Stage 2 – part I“ in 2017-2018. Consortium of suppliers (State Geological Institute of Dionýz Štúr, ÚJV Řež, DECOM) elaborated following documents:

- B.1 Project of geological task.
- B.2 Framework Programme for Development and Research in the area of deep disposal, implementation requirements included.
- B.3 Proposal for Implementation of system for economic stimulation of localities affected by development and operation of Deep Repository.
- B.4 The Final Report of the task.

The document „*B.4.2 Plan of works for the years 2019 -2024 in the area of development of DR in SR*“ forms part of the Final Report. The document is divided into five parts, describing plan of works for particular period in different areas of Programme for Development of Deep Repository of RAW. It concerns following areas specifically:

- Part 1: Coordination of programme of DR RAW
- Part 2: Surveying geological works for locality selection
- Part 3: Public participation in programme for development of DR
- Part 4: Safety demonstration
- Part 5: Feasibility study

**In the part 1** works are focused on programme coordination, criteria updates and comprehensive evaluation of results are described. The part is further divided into following tasks:

- Coordination of individual parts of the Programme for Development of DR RAW
- Comprehensive evaluation of the Stage 2 of locality selection and elaboration of work procedures for the next stage
- Criteria updates for locality selection and evaluation of localities
- Legal analysis and proposal of legislative amendments related to the programme of DR RAW in Slovakia
- Development of the cost structure and risk analysis related to the project of DR
- International Repository

The Programme for Development of Deep Repository represents consistency of many activities, results of which should be Deep Repository operating after **2065**. From this perspective it is essential that the flows of activities indicated in above mentioned parts of the Programme for Development of DR RAW were planned adequately and coordinated.

**Part 2** especially presents planned geological surveying works, which will be executed in current five prospective localities. Among indicated localities attention is paid mainly to two localities, for which the Project of geological task was developed. In case of other three localities, elaboration of preparatory documentation for planned geological works is assumed. The Part 2 consequently, is divided into two tasks:

1) Surveying geological works in localities Tribeč and Western part of Rimava basin

The Project of geological works (Slaninka et al., 2018) was elaborated for above mentioned localities. The period for executing of projected geological task is planned for 66 months, completion of the task is expected in December 2024. However, the precondition is early work commencement and minimum stoppages in work execution (e. g. risk of prolonged administrative processes and different participants interests management). Following activities will be implemented especially within geological works: development of structure, processing of archived information and operation of geological information system for DR RAW; geological mapping, structural geology, petrography, mineralogy; geophysical research; hydrogeological and hydrological research, monitoring; geochemical and hydro-geochemical research; research of geotechnical characteristics and engineering geology; drilling work; creation of 3D synthetic models and final processing. **The primary outcome** of geological task will take form of the Final Report of geological task summarizing the results of implemented works and respective partial evaluations.

## 2) Preparatory documentation of geological task for three remaining localities

Preparatory documentation pursuant to § 15 of the Resolution of MŽP SR No. 51/2008 Coll. for localities „Southwestern part of Stolické mountains“, „Southern part of Veporské mountains“ and „Eastern part of Cerova mountains“ will be elaborated. General objective of preparatory documentation elaboration for three indicated localities is preparation of supporting documents for design of surveying geological works at the localities. Surveying works implementation at these particular localities is expected in a similar scope as for localities Western part of Rimava basin and Trábeč for the period after 2024. Outcome will take form of documents elaborated separately for each locality.

**Part 3** describes activities, important for transparent communication and early and effective public participation in locality selection process for DR. The objective of transparent communication is to establish public credibility and set conditions for successful final locality for Deep Repository in Slovakia selection accepted by the public.

The first task is focused on local public participation. Activities in the first task are projected with regard to early participation of all affected municipalities, especially in localities, where geological surveying will be conducted. Cooperation with the public should be supported by establishing of information commission, which should be conducive to organization of information activities in locality. Organization of visits for representatives of public from particular localities falls under the scope of this task.

The second task involves primarily supporting activities for public participation, among others public opinion polls and information campaign preparation at the local and national level.

There is also necessity to share information among DR project task force, professional public and representatives of various government departments affected in order to demonstrate support for transparency to general public. Regular interdepartmental meetings will serve to this purpose. Skills upgrading of experts should be supported by education as well as participation in international activities.

Separate chapter is assigned for the stimulation of public, which should be included in cost budget for locality selection of DR. Stimulation of public rests predominantly with economic support of affected communities in relation to activities of public participation in the first task of the third part.

**Part 4** focuses on demonstration of operational and long-term safety. Demonstration of DR safety is crucial aspect for all stages of approval processes from the side of state regulation, as well as for general acceptance of repository viewed as passive safe nuclear installation for the whole period of operating life thereof. The safety of Deep Repository - operational and long-term – is ensured by meeting conditions formulated ahead of its operation, listed under existing legislation in form of limits and conditions for safe operation. These conditions are one of safety analysis outcome.

Providing evidence for safety is understood as summary of data, arguments and knowledge, primary aspect of which is demonstration of operational and the long-term safety. It is evident, considering above mentioned facts, providing evidence for DR safety operation is the crucial indicator for permission for siting, construction and operation. Science and



research for support of the long-term NI safety are structured into areas depending on needs for information or data connected with various components of disposal system. Safety reports for localities explored, based also on feasibility studies are essential objective of this stage. The Part 4 comprises of more tasks:

- Research for demonstration support of DR long-term safety
  - Source member
  - Package forms materials selection for SNF and RAW in DR surroundings
  - Analyze of behavior of absorbing and filling materials composed of bentonite
  - Analyze of behavior of materials composed of cement/concrete
  - Analyze of migration and interaction of radionuclides in rock surrounding
  - Research of analogues
  - Establishing of database of data for safety analysis, uncertainties identification included
- Operational safety
- Safety demonstration

**Part 5** is focused on demonstration of Repository feasibility at localities explored. The Repository and its engineering barriers shall be designed for safety disposal of waste with all risk arising from it, in order to be physically and chemically compatible to host geological formation and/or surface environment and at the same time designed to provide safety features after closure, which complete the characteristics, which are present in locality of host environment.

DR feasibility study serves for the demonstration of DR viability, projected for the end of this stage of DR development. They will also be considered outcomes of this stage of works. Its update is periodical depending on required level of detail in each stage of DR development. These activities will be developed especially in later periods of programme preparation for DR. The Part five is divided into tasks.

- Technological development of disposal package forms
- Technological development absorbing, sealing and backfilling materials and production thereof
- Technological development of construction materials composed of concrete/cement and production thereof
- Technological development of operational activities
- Design solution of Deep Repository.

Based on above mentioned documents, JAVYS, a. s. will organize selection procedure for general supplier for implementation of activities in locality selection (geological activities, terrain and exploratory works in preselected localities, safety demonstration, public participation support etc.) in following period, in order to make possible to adopt final decision on siting of Deep Repository in SR until 2030.

Task was assigned to Minister for Economy of SR by the Decree of the Government of SR No. 402 of 5 September 2018 in line with recommendations of 6. Review meeting pursuant to *Joint Convention on Safety of Management of the Spent Fuel and on Safety of Management of RAW*, „to develop staged time table for preparation for Deep Geological Repository, including strategy for communication with public and to determine crucial

*milestones of the project, forming supporting materials for planned update of the National Policy and the National Programme for Management of SNF and RAW in SR“ until 31 May 2020.*

Staged time table as one of the tools of DR project preparation resulting from conceptual document of IAEA for particular area (ROADMAP) in parallel to description of mutual relations and conditionalities inter alia, should contain also data on who and under which conditions will adopt, respectively will be able to adopt (accept) individual decisions concerning locality selection.

## **6. Evaluation concerning Chapter 5 of the National Programme the Need for research, development and demonstration activities**

As far as research, development and demonstration activities are concerned, in addition to already described areas of Deep Repository, activities of research, development were implemented in 2018, what is highlighted in following figure, respectively projects indicated in the Report for 2017 continued:

**Figure No. 1: Projects/tasks focused on research and development activities in 2018**

Title and content of task/project	Competent organization in SR	User of outcomes	Financial arrangement
THERAMIN Thermal Treatment for RAW Minimization and Hazard Reduction	VUJE, a. s.	The European Commission, user of partial outcomes JAVYS, a. s.	The European Commission, H2020 Euratom Programme
Development of fixation matrix for sludges from chrompik	VUJE, a. s. within decommissioning outputs of NPP A1	JAVYS, a. s.	NNF resources within costs for decommissioning of NPP A1

Project THERAMIN involving up to 20 professional organizations within Europe contributed to optimization of input materials (glass, additives) for vitrification of chrompik and its effect is manifested throughout exchange of experience and transfer of know-how in the area of monitoring and declaration of fixation matrix from thermal processing of RAW among renowned organizations in EU.

On one hand fixation matrix development for sludges from chrompik is executed in framework of tasks for the Stages III and IV of NPP A1 decommissioning, but on the other hand implemented activity is of development and scientific nature, although it is in principle specific and connected only to field of NPP A1.

Memorandum of Understanding was concluded between company JAVYS, a. s. and Czech company Správa úložisk RAW (SÚ RAW) in 2018, purpose of which is to ensure mutual exchange of information and experience in research and development during process of Deep Repository building.

Activities proposed respectively assumed in the area of research and development of DR in SR are described within the task No. 18 in the Chapter No. 2.

## 7. Evaluation to Chapter 7 Plan of costs

Within evaluation of status of financial resources necessary for the coverage of costs for the Final Stage of nuclear power engineering in relation to Chapter 7 of the National Programme containing data on assumed total costs at price level of 2014 (€ 8 000 million), data of 31 December 2018 are as follows:

- total sum of accumulated financial resources on NNF accounts: € 1 620,0 million,
- the sum of financial resources spent for the coverage of costs on NPP A1 sub-account: € 682,7 million,
- the sum of financial resources spent for the coverage of costs on NPP V1 sub-account: € 199,0 million (including SNF storage),
- the sum of costs incurred for RAW disposal from NPP A1 and from NPP V1 in NR RAW: € 36,7 million,
- the sum of financial resources incurred to Deep Repository development: € 3,03 million.

Overall, financial resources were incurred to NPP A1 and NPP V1 decommissioning (including SNF storage and disposal of RAW in NR RAW in Mochovce) in amount of € 918,4 million of NNF resources and € 306 million of EU resources to date 31 December 2018.

In process of new Act on NNF preparation, the methodology for determination of the level of compulsory contributions and compulsory payments to NNF was adopted and resulting amounts were transferred into proposal of Government Decree on compulsory contributions and compulsory payments to NNF in 2018. This will ensure financial resources for the the coverage of costs of the Final stage of operating installations. The level of assumed costs for Deep Repository amounting to the sum of **€ 3 573,4 million**. Amount of compulsory contributions for operating nuclear power plants and their reimbursement pursuant to new Government Decree effective from 1 February 2019 will not jeopardize delivery stability of electricity in SR.

Transfer from MH SR from resources in form of a delivery is collected by the operators of distribution systems and transmission system included in payments of end users for electricity delivered. This serves for financing of NPP A1 and NPP V1 decommissioning. The Government Decree on the level of delivery for the year 2019 was discussed and adopted in legislative procedure in relation to new Act on NNF endorsed. The Government Decree is effective from 1 February 2019. Analysis of historical deficit and proposal of procedure for securing of financial resources for the coverage thereof is expected within preparation of the National Programme update, which will be compiled until the end of 2021.

Expected costs for operating installations decommissioning are involved in (updated) conceptual decommissioning plans. Expected costs for NPP V1 decommissioning comprising of BIDSF projects and related costs are the subject of updated detailed plan for NPP V1 decommissioning. Expected costs for NPP A1 decommissioning are available at present

from data indicated in adopted National Programme for Management of SNF and RAW, update of which will take part within preparation analysis for the Stage V of NPP A1 decommissioning.

## **8. Proposals of modifications of the National Programme in the forthcoming revision**

EC provided the protocol of workshop held in November 2017 organized by EC with participation of MH SR, NRA SR and NNF representatives in 2018. In addition to crucial role of deep repositories development, the aspect of monitoring of national programmes and progress thereof pursuant to the Article 12 of the Directive 2011/70/EURATOM is highlighted in EC report. As a result, it is necessary to determine responsibilities, milestones and indicators for monitoring and programmes implementation. Determining of effective indicators (Key performance indicators) and evaluation of programmes implementation is considered to be a priority by EC, whereby it is important to bear in mind own evaluation of programmes implementation and preparation and conducting of peer review of national programmes.

The term for execution of peer review of system of decommissioning and management of SNF and RAW in SR originally proposed for the year 2020, was scheduled for the year 2021, based on consultation between NNF and NRA SR. In the meantime, NNF will monitor news about results of similar peer reviews in other member states of EU. In addition, information gained from analyzing programmes of other member states will become incentives for an update of the National Programme of SR. At the same time attention will be paid to projected update of economical part and considering technical and scientific progress in the area of decommissioning of nuclear installations and management of SNF and RAW.

Update of the National Programme and the National Policy will apply to following areas primarily:

- calculation of compulsory contributions and compulsory payments,
- analysis of historical deficit and time table of settlement thereof,
- update of the procedure in the area of locality selection for Deep Repository,
- supplement of the indicators for monitoring and demonstration of progress in implementation of the National Programme not only in the area of management of SNF and RAW, but also in other parts of the Final Stage of Nuclear Power Engineering, especially in the area of NPP V1 decommissioning (projected until 2025) and NPP A1,
- other content and structural modifications of these strategic documents.

Comprehensive evaluation of present strategy and analysis of needs in the area of the Final Stage of Peaceful Use of Nuclear Energy in SR implementation for further period will be executed among others. Moreover, particular legislative amendments implemented until the period of next following update of the National Programme, respectively the National Policy may affect these documents (e. g. modification of responsibilities in SNF management). This implies it will be necessary to consider gradually about harmonization thereof.

## 9. Conclusion

In process of implementation of the National Policy of Management of the Spent Nuclear Fuel and Radioactive Waste and the National Programme for execution of the National Policy so far a progress has been recorded, not only in National Programme partial objectives implementation but also in the area of nuclear power plants (NPP A1 and NPP V1) decommissioning and management of SNF and RAW. They represent crucial activities of the Final Stage of Peaceful Use of Nuclear Energy in SR. Moreover, the progress in the area of determination of compulsory contributions and compulsory payments intended for the coverage of costs for the Final Stage of operating nuclear installations based upon new Act on NNF and adopted methodology as an integral part of updated National Programme may be considered to be outcomes achieved in 2018.

Decommissioning of nuclear power plants NPP A1 and NPP V1 including management of RAW and SNF was in process in 2018 in conformity with project time tables and in line with the National Programme and financial plans in the area of reimbursement of costs for the Final Stage of Peaceful Use of Nuclear Energy in SR. Progress in the area of development of Deep Repository in SR, with critical comments from NRA SR in 2017, notably for very little progress demonstrated, was continued exclusively in the area of proposal for further steps in 2018. Although this progress is still not significant, this area is considered to be one of crucial with high importance in future, as well as with the need for determining of legitimate and acceptable procedure by the public.

Opinion of NRA SR to the Report for the period up to 31 December 2017 contained important warnings and critical reviews concerning description of particular activities in 2017. Comments to individual points, whether in form of highlighted facts important to bear in mind, or in form of recommendations for further progress were integrated respectively reflected in relevant points of this Report for the period 2018.

Based upon the first overall review of National Programmes by EC issued in 2017, and on the grounds of overall review of state pursuant to the protocol of EC from the workshop on implementation of the Directive 2011/70/EURATOM, issued in November 2018, it may be possible to conclude, that the National Policy in SR is executed in conformity with the Directive 2011/70/EURATOM, and management of RAW and SNF is implemented in consistency with international good practice.