

decommissioning of non-operating technologies in various places/rooms, management of waste arising from these activities, treatment of case of A1 long-term spent fuel storage and long-term spent fuel storage. The subsequent section is devoted to the management and handling of contaminated soil, concrete and construction waste, including management of VLLW.

TREATMENT AND CONDITIONING OF SOLID AND LIQUID RAW

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(JAVYS a.s.)

Jadrová a vyrad'ovacia spoločnosť, a.s. implements activities within the processes of treatment and conditioning of radioactive waste (RAW) at two nuclear facilities, one of them located in Bohunice - Technologies for treatment and conditioning of RAW. This nuclear facility includes: Bohunice RAW treatment centre, bituminisation lines, waste water purification station and technologies for sorting, fragmentation and decontamination of metallic RAW.

The Bohunice RAW treatment centre (BRTC) in Bohunice processes and conditions liquid and solid radioactive waste produced during the A1 NPP and V1 NPP decommissioning, waste from the operation of V2 NPP in Bohunice as well as from the operation of NPP EMO 1,2 in Mochovce.

The BRTC includes the following technological facilities: sorting, high-pressure compaction, incineration, concentration and cementation.

The final product is a fiber-concrete container filled with a cement mixture and fixed RAW. Radioactivity, fixed in a cement matrix and stored in a fiber-concrete container with a long-term integrity represents a safe storage that neither endangers humans nor the environment.

All information, in particular about the content of the container, is recorded in an accompanying letter of the container that constitutes an important document for archiving data about RAW disposed at National RAW Repository in Mochovce.

Bituminisation lines process low-level liquid waste from the A1 NPP and V1 NPP operation and decommissioning as well as from the operation of V2 NPP. The bituminisation facility consists of two lines for processing of radioactive concentrates, low-active water purification station and discontinuous bituminisation line for bituminisation of spent resins.

Technologies for sorting, fragmentation and decontamination of metallic RAW are intended for sorting and cutting the material by plasma-cutting and oxy-fuel cutting, fragmentation by hydraulic shears, cutting with a circular, transverse and longitudinal saw, by grinding and decontamination by jet-blasting (dry method), or at a large volume decontamination line (wet method). The objective of a decontamination process is to reduce contamination of metallic RAW to the limit suitable for release of metallic material into the environment.

LOW LEVEL RADIOACTIVE WASTE DISPOSAL

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The Mochovce National Radwaste Repository is a near surface multi-barrier disposal facility for disposal of processed low and very low level radioactive wastes (radwastes) resulting from the operation and decommissioning of nuclear facilities situated in the territory of the Slovak Republic and from research institutes, laboratories, hospitals and other institutions (institutional RAW) which are in compliance with the acceptance criteria.

The basic safety requirement of the Repository is to avoid a radioactive release to the environment during its operation and institutional inspection. This commitment is covered by the protection barrier system. The method of solution designed and implemented at the Repository construction complies with the latest knowledge and practice of the repository developments all over the world and meets requirements for the safe radwaste disposal with minimum environmental consequences. All wastes are solidified and have to meet the acceptance criteria before disposal into the Repository. They are processed and treated at the Bohunice RAW Treatment Centre and Liquid RAW Final Treatment Facility at Mochovce.

The disposal facility for low level radwastes consists of two double-rows of reinforced concrete vaults with total capacity 7 200 fibre reinforced concrete containers (FCCs) with RAW. One double-row contains 40

vaults and one vault has capacity 90 FCCs. The vaults are covered with reinforced concrete panels for a biological shield protecting the operating staff and the both double-rows are covered by a steel-structure buildings.

The operation of the Repository was started in year 2001 and after ten years, in 2011 was conducted the periodic assessment of nuclear safety with positive results. Till the end of year 2014 was disposed to the Repository 11 514 m³ RAW. The analysis of total RAW production from operation and decommissioning of all nuclear installation in SR, which has been carried out in frame of the BIDSF project C9.1, has showed that the total volume estimation of conditioned waste is 108 thousand m³ of which 45.5 % are low level waste (LLW) and 54,5 % very low level waste (VLLW). On the base of this fact there is the need to build 7.5 double rows for disposal all LLW and to build new VLLW repository for a total capacity of 68 thousand m³.

The disposal space for VLLW of the repository will be built sequentially in three stages:

- I. stage - building of the cell (module) for 20 000 m³ for the needs of NPP A-1 Decommissioning
- II. stage - construction of the cell (module) for 9000 m³ for the needs of V1 NPP Decommissioning
- III. stage - envisages construction of the remaining amount of disposal capacity in the future, respectively according to the needs and waste production VLLW

In December 2014 the I. stage the construction of the VLLW repository have started.

The effort to dispose of VLLW separately in repositories with lower requirements for some engineering barriers mainly regarding the packaging form of the disposed waste itself as well as concrete disposal structures, in general improves the economy of disposal without changing the nuclear safety.

THE BACK-END OF THE NUCLEAR FUEL CYCLE IN SLOVAKIA – THE PRESENT AND THE FUTURE

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According to Council Directive 2011/70/EURATOM establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, each Member State remains free to define its fuel cycle policy. The spent fuel can be regarded either as a valuable resource that may be reprocessed or as radioactive waste that is destined for direct disposal. Whatever option is chosen, the disposal of high-level waste, separated at reprocessing, or of spent fuel regarded as waste should be considered. The storage of radioactive waste, including long-term storage, is an interim solution, but not an alternative to disposal.

In the strategy of nuclear energy back end approved by the Slovak government in 2008 and updated in 2014, is a spent fuel management concept based on interim spent nuclear fuel facilities and deep geological repository.

Currently, 4 nuclear reactors are in operation in Slovakia, which use the so-called open fuel cycle, 2 nuclear units being under construction in Mochovce site - commencement of operations is planned in 2017 and 2018. All units are using the same type of fuel VVER-440. In the future, a construction of new nuclear power plant at Bohunice site is being considered.

The operation of nuclear reactors generates spent fuel. At the end of the short-term storage period near the reactor, the fuel is transported into the interim spent fuel storage facility (ISFS) in Bohunice site. The ISFS is the wet type storage facility, where the fuel of VVER-440 type is being stored in the pools of demineralized water. The original ISFS capacity was 5,040 pcs of fuel assemblies (FA). Between 1997 and 1999, a reconstruction of the ISFS had been performed and aimed at increasing the seismic resistance and increasing the storage capacity up to 14,112 pcs of FA (1700 t of heavy metal). Considering the lifetime extension of power plants up to 60 years, the VVER-440 units in Slovakia will produce approximately 32,658 pcs of FA (3900 t of heavy metal). Currently ISFS is filled on 81% and at the current production of spent nuclear fuel (SNF) the storage capacity will be sufficient until 2024. Therefore the construction of a new dry storage type facility is being considered. The new spent fuel storage capacity will serve for long-term storage of the SNF produced by all nuclear power plants in the Slovak Republic taking into account that the company JAVYS, a.s. is a legal entity established and authorised by the Ministry of Economy and provides for spent fuel storage pursuant to Slovak Atomic Act, which states: "In the interest of provision of nuclear safety and prevention of ungrounded accumulation of radioactive wastes and SNF, the licence holder is obliged, during nuclear installation, commissioning and operation, to hand over SNF from their production immediately after the fulfilment of requirements for its safe transport and storage, to the legal entity established for further management."