MINISTRY OF INDUSTRY AND TRADE
OF THE CZECH REPUBLIC

UPDATE
OF THE CONCEPT OF RADIOACTIVE WASTE AND SPENT NUCLEAR FUEL MANAGEMENT

(NATIONAL PROGRAMME OF THE CZECH REPUBLIC)

Prague, November 2014

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MINISTRY OF INDUSTRY AND TRADE
OF THE CZECH REPUBLIC

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Glossary of abbreviations

Abbreviation	Explanation
ČNB	Czech National Bank
ČBÚ	Czech Mining Authority
ČEZ	Czech power company
ČVUT	Czech Technical University in Prague
DGR	Deep geological repository
EC	European Commission
EDU	Dukovany NPP
EEC	former European Economic Community
ENEF	European Nuclear Energy Forum
ETE	Temelín NPP
EU	European Union
EURATOM	European Atomic Energy Community
FJFI ČVUT	ČVUT Faculty of Nuclear Sciences and Physical Engineering
FSC	Forum on Stakeholder Confidence
GAČR	Czech Grant Agency
GTRI	Global Threat Reduction Initiative
HLW	High-level radioactive waste
HM	Heavy metals
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
IGD-TP	Implementing Geological Disposal – Technology Platform
JAVYS	Nuclear Decommissioning Company (Slovakia)
LILW	Low- and intermediate-level radioactive waste
MPO	Ministry of Industry and Trade
MŠMT	Ministry of Education, Youth and Sports
MŽP	Ministry of the Environment
NAPRO	ENEF's Group for the preparation of recommendations for National waste management programmes
NEA-OECD	Nuclear Energy Agency of the Organisation for Economic Co-operation and Development
NJZ	New nuclear units
NORM	Naturally occurring radioactive materials
NPP	Nuclear power plant
RRRFR	Russian Research Reactor Fuel Return
RAW	Radioactive waste
SEA	Strategic Environmental Assessment
SNF	Spent Nuclear Fuel
SÚJB	State Office for Nuclear Safety
SÚRAO	Radioactive Waste Repository Authority
TAČR	Czech Technology Agency
ÚRAO	Radioactive waste repository
ÚVVVR	Former Institute for the Research, Production and Use of Radioisotopes
VLLW	Very-low-level radioactive waste

Glossary of terms

Term	Definition
Institutional control	A set of operations concerning the maintenance and monitoring of the site and the radioactive waste repository proper following repository closure which are carried out for a period of time specified in the relevant documentation. Institutional control can be either active or passive.
RAW management	All operations relating to the collection, sorting, processing, treatment, storage and disposal of radioactive waste except for its transportation outside the site in which the said operations are performed.
SNF reprocessing	Operations aimed at obtaining material for further use from spent nuclear fuel.
RAW producer	A person through whose activities radioactive waste is produced.
Radioactive waste (RAW)	A radioactive substance or item or facility containing a radioactive substance or contaminated thereby the future use of which is not intended and which does not meet the criteria for radioactive substance release from the facility.
RAW/SNF storage	The time-limited emplacement of RAW or SNF in an area, structure or installation with the intention of retrieval.
RAW disposal	Permanent RAW emplacement in an area, structure or installation without the intention of retrieval.
RAW repository	An above-ground or underground area, structure or installation used for radioactive waste disposal.
Closure of RAW repository	Completion of all activities relating to radioactive waste management and waste processing into a form which will be safe in the long term.
Spent nuclear fuel (SNF)	Irradiated nuclear fuel which has been permanently removed from the active zone of a nuclear reactor. Spent nuclear fuel may be considered a potential power source or intended for permanent disposal.
Decommissioning	Administrative and technical procedure aimed at the complete release of a nuclear facility from regulatory control; two decommissioning methods can be used: 1. immediate decommissioning – decommissioning operations are performed continuously from decommissioning commencement and extending over the entire decommissioning process to completion in one stage or in several successive stages, specified in terms of materials and time; or 2. deferred decommissioning – decommissioning operations are divided into several successive stages, specified in terms of materials and time and separated by one or more periods of time.
Facilities for RAW and SNF management	Facilities the primary purpose of which is radioactive waste and spent fuel management.

1. INTRODUCTION

A safe nuclear energy sector which is sustainable over the long term is one of a number of important preconditions for continued industrial development and the maintenance of the current standard of living in the Czech Republic. Radioactive sources are used in a large number of industrial processes, research and health sectors. The peaceful use of nuclear energy and ionising radiation, however, involves the generation of radioactive waste.

The State Energy Concept, which sets out national strategic objectives for the energy sector, envisages the construction of two new nuclear units at the Temelín NPP and the extension of the lifetime of the existing four units and construction of a fifth unit at the Dukovany NPP. It is conceivable that, over the long term, nuclear energy will provide as much as 50% of electricity generation in the Czech Republic thus replacing a significant number of coal-fired power stations. Consequently, the implementation of a comprehensive Concept of radioactive waste and spent nuclear fuel management makes up a significant element of the overall system concerning the peaceful use of nuclear energy and ionising radiation.

The Concept of Radioactive Waste and Spent Nuclear Fuel Management in the Czech Republic (hereinafter referred to as “the Concept”), which set out the relevant principles, objectives and procedures to be followed, was approved by Government Decision No. 487/2002 as early as in 2002. The updated Concept complies with Article 6.2 of the current Concept which envisaged its assessment after 2010. The updated Concept is based on the current situation concerning low-level and intermediate-level radioactive waste management, the development of a deep geological repository for RAW and SNF disposal, legislative changes, Government programming documents and international experience and trends. The updating of the Concept is further motivated by preparations for the construction of a new nuclear unit in the Czech Republic, legislative developments within the EU and IAEA and OECD/NEA recommendations. A further significant factor with regard to the EU was the establishment of the expert European High Level Group on Nuclear Safety and Waste Management and the European Nuclear Energy Forum – ENEF in 2007 the aim of which was to harmonise procedures relating to nuclear security and RAW and SNF management in the EU.

Since 2002, the year in which the current Concept of RAW and SNF Management was approved, a number of EU directives and European Commission recommendations have been adopted which are embedded in Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent nuclear fuel and radioactive waste (hereinafter referred to as “Council Directive 2011/70/Euratom”). The directive obliges all Member States to notify the European Commission by 23 August 2015 on the content of their national programmes; those chapters of the Concept which contain European Commission national programme requirements are identified in Annex I to this document.

1.1 Objectives of the Concept

The Concept of RAW and SNF Management in the Czech Republic is a basic document which formulates the principles, State objectives and procedures to be adhered to for the period to approximately 2030 with an outlook for the following period. The assessment of the extent to which the targets and objectives of the Concept have been fulfilled and their subsequent updating and/or refinement is envisaged after 2025. The Concept enables those organisations which produce radioactive waste and spent nuclear fuel or are engaged in radioactive waste management to prepare strategies and plans in compliance with the said principles, objectives and recommendations and to integrate them into their activities. The Concept, which is regularly assessed and updated, recommends effective solutions for safe waste management in compliance with requirements for the protection of human health and the environment without unfairly passing on responsibility for the consequences of the current uses of nuclear energy and ionising radiation to future generations.

The aims of the Concept are as follows:

- to determine and refine strategically justified and scientifically, technologically, ecologically, financially and socially acceptable principles and aims concerning RAW and SNF management in the Czech Republic;
- to maintain a system framework to aid the decision-making process at institutions and organisations responsible for RAW and SNF management in the Czech Republic;
- to communicate in an understandable manner information on the long-term solution of RAW and SNF management to all the stakeholders concerned and the general public and to allow them to fully participate in the fulfilment of the aims of the Concept;
- to create a framework for the assessment of progress achieved in the field of RAW and SNF management and for the preparation of relevant reports as required by the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management[1] and by Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.

The Concept concerns a number of entities, primarily the following:

- **the Government of the Czech Republic and state authorities in general**
  By adopting the Concept, the Government determines the principles, objectives and priorities for the achievement of the optimum method of RAW and SNF management which will be fulfilled by, among others, the Ministry of Industry and Trade, the Ministry of the Environment and the Ministry of Finance.
- **the State Office for Nuclear Safety**

[1] IAEA, INFCIRC/546 of 24 December 1997.

The Concept reflects requirements set out in various legal regulations related to safe RAW management and specifies those activities which are subject to such regulations thus providing support for state supervision in the field of RAW and SNF management.

- **the Radioactive Waste Repository Authority**
  The Concept represents a basic strategic document for the Authority's long-term, three-year and annual plans of activities which are submitted annually to the Government for approval.
- **Producers of radioactive waste and spent nuclear fuel**
  The Concept forms a framework for decision-making for RAW and SNF producers concerning their business and production strategies.
- **Institutions engaged in the development of methods for the disposal of radioactive waste and spent nuclear fuel**
  It is envisaged that research, scientific, university and final implementation facilities and organisations will utilise the Concept for the planning of their professional capacities and for systematically preparing for the fulfilment of the various requirements ensuing from the implementation of the Concept.
- **General public**
  The Concept provides basic information on the aims and priorities pertaining to the field of RAW and SNF management which are in compliance with relevant international standards and recommendations.

1.2 Basis for the updating of the Concept

The updating of the Concept is based on an assessment of the current stage of fulfilment of the Concept approved by the Government in 2002 (Annex 2) and an expert estimation of future trends concerning the peaceful uses of nuclear energy and ionising radiation. Preparation for the updating of the Concept was also based upon experience gained and methods applied in terms of RAW and SNF management in other countries as well as a range of international recommendations; in addition, provisions contained in the Czech Land Use Development Plan for 2008 and the State Energy Concept (2012) were taken into account. It is envisaged that, subsequent to 2025, the Concept will be re-assessed and the relevant aims and objectives updated.

The approach to RAW and SNF management issues in other countries, particularly within the EU, is considered in the updated Concept and potential alternatives are discussed regarding the treatment of SNF at the global level. With regard to institutional waste, i.e. waste produced in the research, industrial and health sectors, it is assumed that a similar amount of radioactive waste will be produced as in the previous period with the exception of a short-term increase over the next five to ten years due to the removal of environmental burdens at ÚJV Řež and, over the longer term, due to the decommissioning of research reactors.

The updating of the Concept is also based on requirements ensuing from Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.

1.3 Current state of RAW and SNF management

Radioactive waste and spent nuclear fuel are generated in the Czech Republic as a result of the peaceful use of nuclear energy and ionising radiation in the industrial, health care and research sectors. In addition, materials contaminated by natural radionuclides are produced as a result of uranium ore mining. Czech legislation, in the same way as that of certain other European countries, considers the residue of uranium ore mining not as radioactive waste but rather as a potential raw material.

Spent nuclear fuel and high-level waste generated from reprocessing fall into the most hazardous RAW category, i.e. that which relates to the operation of nuclear reactors. As a consequence of its high activity level and relatively high content of long-term radionuclides, it is assumed that SNF, subsequent to its being declared to be RAW or HLW, will be disposed of in deep geological formations. The Concept of RAW and SNF in the Czech Republic of 2002 requires that a deep geological repository be developed, the operation of which is planned to commence in 2065.

Following removal from the reactor, SNF is stored for several years in a spent nuclear fuel cooling pool in the proximity of the generating unit and subsequently transferred to a dry storage facility where it is stored in specially-designed storage containers; dry storage technology has both been proven over the long term and is practically waste free. An interim storage facility for SNF was commissioned in 1995 at the Dukovany NPP site; the facility reached its capacity of 600 tonnes in March 2006. A new interim storage facility with a capacity of 1,340 tonnes was commissioned at the site in December 2006. As for the Temelín NPP, a storage facility with a capacity of 1,370 tonnes has been in operation at the site since September 2010. It is estimated that the current storage capacity at the EDU site will suffice for the storage of SNF from existing EDU generating units for the next 45 years of NPP operation. As for the currently operational generating units at the Temelín NPP, it is supposed that the storage capacity will suffice for approximately 30 years of operation. Up to the time at which a deep geological repository is commissioned, SNF from both NPPs will be stored in transportation-storage containers at these two NPP sites. With regard to the potential construction of new nuclear generating capacity, a number of variants concerning the future storage and disposal of resulting RAW and SNF have been assessed including a variant which envisages a centralised storage facility for the storage of SNF generated in the future.

Highly-enriched SNF from the experimental nuclear reactor at the ÚJV Řež was in the past transported to the Russian Federation for reprocessing. The residual waste generated by reprocessing will subsequently be returned to the Czech

Republic. With regard to other SNF produced by research reactors and HLW generated by reprocessing, it is planned that sufficient storage capacity will be created at the ÚJV Řež itself or, where appropriate, at the Research Centre Řež.

RAW in gaseous, liquid and solid form is generated during the operation and decommissioning of nuclear reactors and when dealing with ionising radiation sources. A smaller proportion of RAW is made up of transient waste the radioactivity level of which, following short-term storage, is lower than clearance levels; such waste can safely be returned to the environment. Low and intermediate level waste makes up the largest category of radioactive waste in terms of volume. The technology for the processing and conditioning of such radioactive waste prior to its disposal is well-established and is implemented by RAW producers in the Czech Republic. LILW ceases to be radioactive after a few hundred years and, therefore, can be disposed of in near-surface repositories.

LILW generated at nuclear power plants is disposed of in a surface disposal facility located within the Dukovany NPP complex. The facility's total disposal capacity is able to accommodate all the waste generated by the operation and decommissioning of the Dukovany and Temelín NPPs, provided that the waste meets acceptability criteria, even if the lifetime of these power plants is extended to 60 years.

LILW generated by the industrial, research and medical sectors is disposed of at the Richard (near Litoměřice) and Bratrství (near Jáchymov) repositories; the Dukovany repository is also partly utilised for this purpose.

The system which governs the centralised processing and treatment of RAW generated by producers outside the nuclear energy sector is managed on a commercial basis by ÚJV Řež which possess the relevant technology and is a holder of the licences required by legislation.

The operation of all Czech repositories, including the monitoring of the now-closed Hostim repository, is managed by SÚRAO in compliance with the relevant licences granted by the SÚJB and, in the case of mined cavities, in compliance with permits and licences issued in accordance with mining regulations.

A certain amount of RAW does not meet acceptability criteria for disposal at existing repositories. Relevant requirements have been defined concerning the method and quality of treatment and conditioning which allow for the storage of such waste both by producers and at SÚRAO's facilities prior to its subsequent disposal in a deep geological repository.

Waste contaminated by naturally-occurring radionuclides makes up a specific waste category. Such waste is generated as the result of the processing of certain non-uranium ores and phosphate raw materials, the transportation and treatment of crude oil and by the water supply sector. If such waste meets requirements for its discharge into the environment, it is disposed of at controlled landfill sites for municipal or hazardous waste; if it does not meet such requirements, it is stored at storage facilities or disposed of together with low-level waste.

The Concept of RAW and SNF in the Czech Republic of 2002 requires that two candidate sites for the construction of a deep geological repository be included in land use development plans by 2015. Following a survey of the whole of the geographical area of the Czech Republic, six sites were identified and subjected to characterisation studies. However, the general public in the sites concerned opposed plans for the construction of a deep geological repository and further geological exploration work was suspended until 2009. Meanwhile, the Czech Land Use Development Plan for 2008, which was approved by Government Decision No. 929 of 20 July 2009, Article (169), charged the Ministry of Industry and Trade and SÚRAO with specifying the surface area of the sites concerned and with determining conditions for the legal protection of land at sites with conditions suitable for the construction of a deep geological repository; legal protection status will apply to these sites up to the time that the two most suitable sites are selected. In addition, the investigation of former military areas was launched by SÚRAO at the end of 2008 in compliance with its plan of activities which was approved by the Government (Government Decision No. 1315 of 20 October 2008). A further site, situated close to a uranium mine in operation at Dolní Rožínka, was added to the list of candidate sites; sites in the vicinity of nuclear power plants have been also under consideration. Geological investigation work must be preceded by a Ministry of the Environment Decision on the identification of investigation areas.

Research and development work in the field of RAW and SNF management has been carried out to date in the Czech Republic, in most cases closely connected with wider EU research programmes. Such research and development activities, which are aimed at providing scientific and technical information concerning the deep disposal of RAW and SNF, improving public awareness of RAW issues and supporting the acceptance of the RAW and SNF deep disposal concept make up important elements of the overall deep geological repository development programme.

2. MAIN PRINCIPLES OF THE CONCEPT

- Only relevant licence holders are eligible to manage RAW and SNF; licences are issued by the State Office for Nuclear Safety provided that requirements specified in the Atomic Act and related implementing regulations have been met.
- RAW and SNF management in the Czech Republic must be conducted in compliance with national strategic aims and internationally recognised principles (IAEA and NEA-OECD recommendations and EC requirements).
- All the costs of RAW and SNF management are borne by the respective RAW and SNF producers. The cost of the disposal of RAW and SNF produced at the present time will not be passed on to future generations.

- RAW and SNF producers are obliged to restrict waste generation to a minimum level, provide SÚRAO with data on short-term and long-term RAW and SNF production and the information required for the defining of the scale of charges and manner of payment to the Nuclear Account; charges for the disposal of LILW and for the disposal of SNF and/or RAW which is unacceptable for disposal in near-surface repositories are calculated separately.
- RAW and SNF management licence holders are further obliged to maintain records of RAW and SNF which document all the RAW and SNF characteristics required by legislation.
- RAW is treated prior to disposal by the relevant SÚJB licence holders, the aim being that RAW including not being used sources of ionising radiation is disposed of without undue delay.
- SÚRAO maintains and optimises the operation of existing LILW repositories and is responsible for ensuring adequate disposal capacity for all the LILW which will be produced in the Czech Republic as a result of the peaceful use of nuclear energy and ionising radiation in the future.
- The basic Czech strategy for SNF management consists of its direct disposal in a deep geological repository which will be prepared for commissioning by 2065.
- Prior to the commissioning of a deep geological repository, SNF and RAW unacceptable for disposal in near-surface repositories will be stored by producers or at facilities managed by SÚRAO.
- RAW and SNF management and the development of a deep geological repository are conducted in full compliance with relevant domestic legal regulations, international recommendations and standards which comply with globally recognised norms.
- Options for reducing the volume of SNF and radiotoxicity will be monitored and assessed on an ongoing basis.
- The public will be fully involved in the RAW and SNF geological repository development process and will be invited to actively participate in the fulfilment of individual stages of the process. The site selection process will be based upon a partnership between SÚRAO and the communities concerned.

2.1 International principles concerning RAW and SNF management

The international community has identified, through the auspices of the IAEA, universal principles concerning the safe and secure use of nuclear energy and ionising radiation which also apply to RAW management. The basic principles are applicable for all member countries and types of RAW and SNF regardless of their physical and chemical characteristics and origin.

The Czech Republic, an IAEA member state, in compliance with its international commitments[2] and national aims, confirms via the Concept, subject to Government approval, that its principal objective consists of the management of RAW and SNF in compliance with the following principles[3]:

- **Responsibility for safety:** The prime responsibility for safety must rest with the person or organization responsible for facilities and activities that give rise to radiation risks.
- **Role of Government:** An effective legal and governmental framework for safety, including an independent regulatory body, must be established and sustained.
- **Leadership and management for safety:** Effective leadership and management for safety must be established and sustained in organizations concerned with, and facilities and activities that give rise to, radiation risks.
- **Justification of facilities and activities:** Facilities and activities that give rise to radiation risks must yield an overall benefit.
- **Optimization of protection:** Protection must be optimized to provide the highest level of safety that can reasonably be achieved.
- **Limitation of risks to individuals:** Measures for controlling radiation risks must ensure that no individual bears an unacceptable risk of harm.
- **Protection of present and future generations:** People and the environment, present and future, must be protected against radiation risks.
- **Prevention of accidents:** All practical efforts must be made to prevent and mitigate nuclear or radiation accidents.
- **Emergency preparedness and response:** Arrangements must be made for emergency preparedness and response for nuclear or radiation incidents.
- **Protective actions to reduce existing or unregulated radiation risks:** Protective actions to reduce existing or unregulated radiation risks must be justified and optimized.

Further related measures include the following:

- **Public participation in decision-making:** Decisions which might potentially impact public health, local communities or the environment should be made in cooperation with those concerned[4].
- **Sustainable development:** As a consequence of the long period of time during which radioactive waste must be safely managed, sustainability aspects must be considered. The requirements of the present generation should be fulfilled without restricting the fulfilment of the needs of future generations.

The updated Concept respects the requirements of Council Directive 2011/70/Euratom, particularly the following:

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[2] Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

[3] IAEA Safety Fundamentals, 2006

[4] Aarhus Convention – International Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters

- The generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials.
- Interdependencies between all steps involved in spent fuel and radioactive waste generation and management shall be taken into account.
- Spent fuel and radioactive waste shall be safely managed, including in the long term with passive safety features.
- Implementation of measures shall follow a graded approach.
- The costs for the management of spent fuel and radioactive waste shall be borne by those who generated those materials.
- An evidence-based and documented decision-making process shall be applied with regard to all stages of the management of spent fuel and radioactive waste.
- RAW can be exported only on the strict condition that all the appropriate international conventions and agreements are respected.
- The principle of transparency shall be applied in communication with the general public.

The update of the Concept respects the following aims of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management:

- to achieve and maintain a high level of safety worldwide in spent fuel and radioactive waste management through the enhancement of national measures and international co-operation, including where appropriate, safety related technical co-operation;
- to ensure that during all stages of spent fuel and radioactive waste management there are effective defences against potential hazards so that individuals, society and the environment are protected from harmful effects of ionising radiation, now and in the future, in such a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations;
- to prevent accidents with radiological consequences and to mitigate their consequences should they occur during any stage of spent fuel or radioactive waste management.

2.2 International agreements

In 2004 the Czech Republic joined a common initiative coordinated by the USA, the Russian Federation and the IAEA concerning the return of highly-enriched nuclear fuel of Russian origin used in research reactors abroad back to the country of production, i.e. the Russian Federation. The Russian Research Reactor Fuel Return (RRRFR) programme, which ensures the repatriation of highly-enriched nuclear fuel of Russian origin, was initiated by the USA (part of GTRI – Global Threat Reduction Initiative) and was aimed at reducing the risk of the proliferation of nuclear materials originating from highly-enriched fuel used in research reactors.

In the context of this initiative, an agreement[5] was signed between ÚJV Řež and TENEX (representing the Maják reprocessing plant). As stipulated in the agreement, RAW from SNF reprocessing will be stored over a period of 17 to 19 years following reprocessing at the Maják plant. It is planned that the first batch of reprocessed RAW, originating from waste transported to the Russian Federation in 2007, will be returned to the Czech Republic between 2024 and 2026. This waste will have to be stored until the commissioning of a deep geological repository. ÚJV Řež agreed to accept the RAW provided that it meets acceptability criteria both for storage and final disposal at the future deep geological repository. The agreement between ÚJV Řež and TENEX refers to an agreement between the governments of the Russian Federation and the Czech Republic on cooperation in the field of nuclear energy which was signed in December 1994.

According to agreements between ČEZ and Studsvik Nuclear AB in Nyköping (Sweden) and JAVYS in Jaslovské Bohunice (Slovakia), solid combustible RAW from the Dukovany and Temelín NPPs is transported to the said companies in order to reduce its volume by means of incineration. Transportation is conducted in compliance with legal regulations valid in all the countries concerned which generally, as in the case of the Czech Republic, have transposed into national legislation Council Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel.

Consequent to an agreement between ČEZ and JAVYS, high-pressure compression technology is used to reduce the volume of solid RAW from nuclear power plants.

3. LEGISLATIVE FRAMEWORK

In addition to material and technical support, the availability of an efficient legislative system and the organisation of a range of support operations constitute essential preconditions for the creation of an efficient RAW and SNF management system primarily comprising the following elements:

- respecting a legal environment which prohibits any action which is in conflict with requirements relating to RAW and SNF management concerning the protection of humans and the environment;
- ensuring the supervision of compliance with respective legal regulations;
- defining the responsibilities and powers of those legal persons and individuals involved in the RAW and SNF management process;
- monitoring and recording of all those activities which might lead to the production of RAW and SNF.

The adoption of the Atomic Act in 1997 and the relevant implementing regulations modified the basic legislative and institutional framework in the Czech

[5] Agreements No. 08843672/70265-059 of 2007 and No. 12 SMN318 of 2012

Republic with regard to RAW and SNF management. The powers and responsibilities of the independent supervisory authority – the State Office for Nuclear Safety (SÚJB)[6] were set out in this Act. The SÚJB issues licences for activities related to RAW and SNF management and has developed a control system and implemented various other measures relating to individual stages of the RAW and SNF management process.

The Radioactive Waste Repository Authority (SÚRAO), established under the Atomic Act in 1997, is responsible, in compliance with the provisions of the Act, for the safe operation of existing RAW repositories, the development of new RAW repositories, the coordination of research and development in this field and the performance of a number of other responsibilities ensuing from the Atomic Act.

In addition to the Atomic Act and the relevant implementing regulations, legislation concerning environmental protection, construction and mining also apply to RAW and SNF management. Natural materials unearthed as the result of the mining and processing of uranium ores are treated, in compliance with Act 157/2009 on mining waste and Act 18/1997 (the Atomic Act), as sources of ionising radiation and thus are not considered in the Concept. Such natural materials are stored in mine dumps and sludge-drying beds which are monitored by the SÚJB with respect to the radiation protection of workers and the general public.

Repositories containing exclusively naturally occurring radionuclides are not considered to be nuclear facilities under the Atomic Act. A selection of relevant legal provisions is provided in Annex 2.

3.1 Radiation protection and general obligations concerning RAW management

Czech legislation relating to radiation protection was developed based on internationally accepted standards and criteria, ICRP recommendations, IAEA safety standards and EU legislation (e.g. Council Directive 96/29/Euratom). Three basic radiation protection pillars have been applied in the legislation: justification, optimisation and dose limitation. These pillars were subsequently incorporated into the Atomic Act and set out in detail in Regulation No. 307/2002 on radiation protection.

The Atomic Act contains nuclear safety and radiation protection requirements for all those activities related to the use of nuclear energy and ionising radiation. Chapter 2 sets out general conditions for the pursuance of such activities. Article 4, paragraph 3 stipulates that:

[6] The SÚJB was established with effect from 1 January 1993 as the successor of the regulatory duties of the Czechoslovak Commission for Nuclear Energy and the Ministry of Health.

"Whoever performs practices related to nuclear energy utilisation or radiation practices shall proceed in such a manner that nuclear safety and radiation protection are ensured as a matter of priority."

This principle is reflected in all the implementing regulations relating to the Atomic Act which specify in detail the basic requirements of the Act and which are binding for all those who realise or ensure the realisation of activities associated with the use of nuclear energy, i.e. design engineers, producers, operators and state supervisory authorities.

The State guarantees, under conditions specified by the Atomic Act, the safe disposal of all radioactive waste including the monitoring and supervision of repositories after their closure.

The Atomic Act, Article 24, paragraph 1 imposes an obligation on any person who manages RAW to take into consideration all the physical, chemical and biological properties of the waste that might have a bearing on its safe management.

The Atomic Act further imposes an obligation on radioactive waste owners or other individuals or legal persons managing the assets of the owner to bear all the costs associated with RAW management from the time of origin to final disposal. This obligation includes the costs of the monitoring of RAW repositories after their closure and those related to the necessary research and development activities.

3.2 Approval process

The basic legal norms, which regulate licensing and approval process relating to nuclear installations and/or facilities with sources of ionising radiation are Act No. 183/2006 on land use planning and the building code (the Building Act) and the Atomic Act. Further related legislation includes Act No. 500/2004 (Administrative Procedure Act), Act No. 100/2001 on environmental impact assessment and the amendment of certain related Acts, and Act No. 106/1999 on free access to information. These Acts are further supplemented by various regulations of lower legal enforcement.

Since the construction and operation of a deep geological or underground repository is considered to be an intrusion into the Earth's crust according to the Mining Act and intrusion into the Earth's crust is considered a mining operation in terms of Act No. 61/1988 on mining operations, explosives and the State Mining Administration, and since the selection and verification process involved in determining a suitable location for such a repository will necessarily involve geological investigation work in terms of Act No. 62/1988 on geological work, these Acts should be mentioned here since they will exert an influence throughout the whole of the life cycle of the future underground or deep geological repository from repository siting through construction, operation and potential extension and final closure.

In terms of the Building Act, the issuance of the three basic decisions required for the construction of a nuclear installation, i.e. building permission, building approval (routine operation) and decisions concerning the removal of buildings falls within the competence of the Ministry of Industry and Trade, i.e. it is the relevant building authority for such decisions, whilst the relevant building authority in terms of land planning permission is the Ministry for Regional Development.

During building proceedings those interests covered by special regulations, e.g. nuclear safety and radiation protection or environmental protection, are also taken into account, in which case the building authority makes decisions in agreement with or upon approval from the relevant state administrative authorities under whose competence such interests fall. The relevant state administrative authority is entitled to require that any special conditions it imposes are fully met, as stipulated in specific legislation. The deciding authority with regard to the environmental impact assessment (EIA) of related constructions is the Ministry of the Environment.

The Atomic Act specifies activities for which SÚJB authorisation is required in addition to the appropriate licences relating to siting, construction, commissioning, operation and decommissioning. This concerns licences for refurbishment or other changes which have an impact on nuclear safety, radiation protection, physical protection and emergency preparedness, the release of radionuclides into the environment, RAW management etc.

3.3 Update of the national legislative framework

The preparation of a new Atomic Act and relevant implementing regulations is currently under way. The new Act will reflect new knowledge and experience concerning nuclear energy and ionising radiation sources as well as stipulations set out in new EU Directives relating to RAW and SNF management and the latest IAEA and NEA-OECD recommendations.

In compliance with a recommendation contained in Council Directive 2011/70/Euratom and recommendations provided by the Working Group of the European Nuclear Energy Forum (“Information and Transparency”), discussion is under way on implementing into the national legislative frameworks a recommendation concerning the strengthening of the position of local communities in the site selection process.

4. RESPONSIBILITY FOR THE IMPLEMENTATION OF THE RAW AND SNF MANAGEMENT CONCEPT

Responsibility for safe RAW and SNF management in the Czech Republic is shared between RAW management license holders (handling, pretreatment, processing, conditioning, storage and disposal) and the State which is responsible for the safe disposal of RAW (Article 25 of the Atomic Act); the State also creates the conditions for the proper functioning of independent supervisory authorities (SÚJB, ČBÚ and MŽP).

Major RAW producers in the Czech Republic consist of the following companies: ČEZ, the operator of the Dukovany and Temelín NPPs; the Research Centre Řež which operates LR-15 and LR-0 experimental nuclear reactors; and ÚJV Řež which processes and conditions into a form suitable for disposal more than 90% of all institutional RAW. In addition, there are a number of small RAW producers in the Czech Republic which utilise ionising radiation sources in the industrial, health and research sectors.

The Ministry of Industry and Trade established the Radioactive Waste Repository Authority (SÚRAO), a state organisation concerned with radioactive waste disposal on the basis of relevant SÚJB licences.

SÚRAO is responsible mainly for the following:

- preparation, construction, commissioning, operation and closure of radioactive waste repositories and monitoring of their impact on the environment;
- radioactive waste management;
- conditioning of spent or irradiated nuclear fuel into a form suitable for its disposal or further utilisation;
- keeping records of radioactive waste receipts and their generators;
- administration of payments;
- drafting of proposals for determination of payments to the nuclear account;
- provision for and co-ordination of research and development in the field of radioactive waste management;
- monitoring of reserves of licensees for decommissioning of their installations and approval of drawing on funds in the reserves;
- provision of services in the field of radioactive waste management;
- provision of contributions to municipalities.

5. PUBLIC RELATIONS

It is clear that RAW and SNF management must be safe and economically viable. Moreover, practically every country in the world with a nuclear agenda is searching for solutions which are acceptable for the general public. Hence, the solution finally chosen must not only be safe and environmentally friendly but also acceptable both for the communities in which facilities are or will be located and the general public. Decisions concerning the final solution must be made in a transparent manner which allows the public not only to express its opinions but also to actively influence the process. An institutional and legislative framework must be established which reflects both the importance and unique nature of such a project. Indeed, such an approach is specified in Article 10 of Council Directive 2011/70/Euratom and is applied in all developed countries with nuclear energy facilities.

A significant amount of documentation describing individual examples from various countries and theoretical studies of the decision-making process have been drafted over many years of intense international debate.

The OECD/NEA Forum on Stakeholder Confidence (FSC) was established in 2000 with the aim of supporting the sharing of international experience concerning the social aspects of RAW and SNF management. The FSC is concerned particularly with determining approaches through which to ensure efficient dialogue between all the parties involved in the decision-making process.

Such issues are also studied by the Working Group of the European Nuclear Energy Forum (“Information and Transparency”) which has adopted a series of 22 recommendations related to the issue of communication in the field of nuclear energy and RAW and SNF management. It is commonly recognised that no one solution can be applied to every country faced with such issues; individual countries have their own unique histories, legal systems, positions (according to past experience) and conditions. The basic principle however is the same for all countries, i.e. the building of partnerships and the search for a balance between the interests of the State and those of the local communities directly concerned. The following paragraphs outline three factors which are of prime importance in terms of the public involvement process.

5.1 Provision of information and communication

The right to free access to information in the Czech Republic is codified in Act No. 106/1999 which establishes rules for the provision of information and free access to information in compliance with the relevant regulation of the European Community (Directive 2003/98/EC of the European Parliament and of the Council on the re-use of public sector information). The right to information on the environment was established by Act No. 123/1999 in compliance with European Community legislation (Directive 2003/4/EC of the European Parliament an of the Council on public access to environmental information) which sets out rules concerning the right both of access to information on the environment and that in a full and timely manner, the creation of conditions for the exercise of these rights and full support for the active disclosure of information on the environment by those obliged to do so.

Availability of information on the back end of the nuclear fuel cycle and RAW and SNF management forms the primary prerequisite for discussion between all interested parties on solutions to such issues. The principal objectives in terms of communication for all parties responsible for RAW and SNF management consist of continuity, transparency and openness of information.

5.2 Incentives for local communities

The provisions of incentives for local communities makes up a standard part of the site selection process and, with regard to communities affected by the siting of an RAW storage or disposal facility, usually relate to three specific types of benefit: financial support, social benefits and the extension of the powers of the municipal authorities concerned.

Incentives are already provided for communities in the vicinity of nuclear facilities, i.e. by ČEZ, the Czech nuclear power plant operator, and SÚRAO, which operates the radioactive waste repositories. In 2012 an incentive scheme was introduced for geological survey at repository candidate sites.

5.3 Involvement of communities

The involvement of affected communities and other stakeholders in the decision-making process is an important element in achieving progress in the preparation of any major project. Such an approach to public participation was applied in the Czech Republic for the first time in connection with the EU ARGONA project (the 6th Euratom Framework Programme for Research and Technological Development) as part of which the so-called Reference Group for Deep Geological Repository Site Selection was established consisting of representatives of the State and selected sites and non-governmental organisations. The task of the Reference Group was primarily to open discussions on issues and problems, however minor or non-relevant they might seem, raised by those living in candidate sites. The Reference Group was subsequently succeeded by the Working Group for Dialogue on the Deep Geological Repository which is made up of, in addition to representatives of the State, representatives from both chambers of parliament, candidate sites and non-governmental organisations. The objective is to design a long-term partnership programme between SÚRAO and the communities affected by the development and subsequent operation of the planned deep geological repository. SÚRAO plans to draft a partnership memorandum the aim of which will be to specify the rights and responsibilities of all the parties involved in the various stages of repository development and operation, to identify the instruments and means of mutual communication and to establish principles governing the financial compensation process. The Concept envisages that the Czech Government will assume the role of guarantor for the long-term partnership programme.

It will be important to ensure into the future that the Working Group is able to conduct its activities independently of the State, to clarify the mechanism governing the processing of the results obtained and to discuss the gradual extension of the range of activities undertaken – it is planned that local working groups will be established at individual sites under the umbrella of the current Working Group. In addition, the relevant funding must be provided both for the Working Group (an independent commission) itself and future locally-based sub-groups.

Full transparency and the active involvement of the communities concerned and the general public in compliance with Council Directive 2011/70/Euratom and recommendations made by European Nuclear Energy Forum working groups make up essential preconditions for a successful and sustainable final decision regarding site selection. Moreover, the establishment of a legislative framework with a clearly specified role for the communities involved in the site selection process forms an essential prerequisite for creating a climate of confidence between the various stakeholders and will contribute towards achieving a consensual solution.

5.4 Concept recommendations for communication with the public

Table 1: Concept recommendations for communication with the public

No.	Objective	Milestone/ Responsible
1	To ensure continuity, clarity and openness of information relating to RAW and SNF management.	Continuously. SÚRAO, SÚJB, RAW producers
2	To ensure both the independence and the extension of the range of activities of the Working Group for Dialogue on the Deep Geological Repository and the creation of a framework for establishing local working groups at individual sites under the umbrella of the current Working Group for Dialogue.	2014/SÚRAO, MPO
3	To discuss draft legislation for the strengthening of the position of local communities in the deep geological repository siting process and submission to the Government for approval.	2015/SÚRAO, MPO, the Government
4	To develop a long-term programme for partnerships between SÚRAO and those communities impacted by DGR development and operation.	2015/SÚRAO

6. RAW CLASSIFICATION AND RAW AND SNF INVENTORY

6.1 Classification of radioactive waste

Radioactive waste is defined in the Atomic Act as “substances, objects or equipment containing or contaminated by radionuclides for which no further use is foreseen”.

According to Regulation No. 307/2002 on radiation protection, RAW is classified as gaseous, liquid and solid. Solid RAW can further be divided into three basic categories, namely temporary, low- and intermediate-level, and high-level waste:

- temporary radioactive waste shall be such waste whose radioactivity after long-term storage (maximum 5 years) does not exceed the clearance levels.;
- low-level and intermediate-level waste is classified into two subcategories. The first subcategory is short-lived waste, in which the half-life of radionuclides contained is shorter than 30 years (including Cs-137) with a limited mass activity of long-lived alpha emitters (in individual packages a maximum of 4000 kBq/kg, and a mean value of 400 kBq/kg in the total volume of waste produced in a calendar year). The other subcategory is long-lived waste, that is waste not ranking in the short-lived radioactive waste subcategory;
- high-level radioactive waste shall be waste for which heat generation from radionuclide decay of the radionuclides contained must be taken into account during its storage and disposal.

SNF is, according to the Atomic Act, considered radioactive waste only after being declared as such by its producer or the SÚJB. Until that time SNF producers are obliged to handle SNF in such a way as not to hinder potential future re-processing or treatment.

6.2 Current RAW and SNF inventory

Radioactive waste originating from the energy sector and from the use of ionising radiation sources in the research, industrial and health sectors (institutional waste) has been disposed of in the Czech Republic since as early as 1959. Legislation requires that all RAW is registered by its producers, processors or SÚRAO. Information on the amount of waste stored and disposed of is regularly published in SÚRAO's Annual Report (concerning particularly RAW disposal in near-surface repositories), in the SÚJB's Annual Report (results achieved in the supervision of nuclear facilities) and in national reports according to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Estimates of the amount of RAW and SNF expected to be produced in the future are regularly updated and included in both near-surface repository safety reports and the deep geological repository development programme.

6.2.1 Inventory of low and intermediate level waste disposed of in existing near-surface repositories

A review of disposed of low and intermediate level waste is presented in Table 2 below.

Table 2: The amount of radioactive waste disposed of in near-surface repositories (Dukovany, Richard, Bratrství and Hostim) as at 31 December 2013

Repository	Volume of disposal facility [m^3]	Volume of RAW disposed of [m^3]	Volume filled [m^3]	Usable capacity for RAW disposal [m^3]	Free volume in total [m^3] *)
Dukovany	55,000	6,590	10,067	30,195	44,933
Richard	10,249	2,631	6,578	1,468	3,671
Bratrství	1,200	336	859	102	341
Hostim	1,690	320	1,690	closed	closed

*) The usability ratio of the volume of disposal facilities for RAW disposal is 0.35-0.67

6.2.2 Inventory of stored waste

Currently stored RAW can be divided into that which can disposed of in existing near-surface repositories and that which must be disposed of in the planned deep geological repository.

6.2.2.1 Currently stored waste which meets requirements for disposal in near-surface repositories

Table 3 shows the total amount of RAW stored at nuclear power stations in concentrate tanks, spent resin tanks and solid waste storage. Subsequently the waste is processed and conditioned into a form suitable for disposal and transferred to the Dukovany repository. Liquid waste is solidified in a bitumen or aluminosilicate matrix. The low-pressure compression technique is usually applied in the treatment of solid waste; however, foreign technologies consisting of high-pressure compression, metal melting and incineration may be employed in certain cases.

Most institutional waste is stored at ÚJV Řež, i.e. RAW arising from past environmental burdens, RAW arising from the activities of ÚJV Řež and RAW accepted from other producers and being processed.

Table 3: Statistics concerning stored radioactive waste as at 31 December 2013

	Amount
Waste from NPP operation	
Liquid waste (concentrate)	1,337 m^3
Spent resins and sludge	207 m^3
Solid waste	309.8 t
Institutional waste	625 m^3

6.2.2.2 Currently stored RAW to be disposed of in the planned deep geological repository

A relatively small amount of activated material (activated measuring sensors, thermocouples, inserted rods, reactor surveillance samples, absorbers etc.) become activated during routine nuclear power plant operation. Approximately 40 tonnes of this type of waste is stored at both Czech NPPs and it is planned that it will be managed as part of the NPP decommissioning process, however, a certain proportion of this waste will be disposed of in the planned deep geological repository.

That institutional waste which will be disposed of in the deep geological repository will include sealed sources, which are currently stored at the Richard repository or by producers, and small, non-sophisticated sources such as disused smoke detectors with ^{241}Am; certain sources stored at the Richard repository have been classified as sources of significant ionising radiation (high-level sources). A larger number of sealed sources are stored by waste producers. As at 31 December 2013, 663 of a total of 5,330 registered sealed sources were stored at interim storage facilities and 1,515 such sources were stored awaiting processing and treatment. [7]

Other waste (189 drums) to be disposed of in the deep geological repository is currently in storage at the Richard repository.

6.2.2.3 Currently stored spent nuclear fuel

SNF from nuclear power plants is currently stored in spent nuclear fuel cooling pools at the respective generating units and in special transportation-storage containers in dry SNF storage facilities located within the premises of both NPPs. CASTOR©440/84, CASTOR©440/84M and CASTOR©1000/19 containers are used depending on the type of SNF.

As at 31 December 2013, there were 60 CASTOR©440/84 containers comprising 5,040 fuel assemblies with a total weight of 581 tonnes of heavy metals (HM) in storage at the interim storage facility at the Dukovany NPP complex. The second Dukovany storage facility contained 24 CASTOR©440/84M containers comprising 2,016 fuel assemblies with a total weight of 231 tonnes of HM.

The dry storage facility at the Temelín NPP site housed 14 CASTOR©1000/19 containers comprising 266 fuel assemblies with a total weight of 133 tonnes of HM as at 31 December 2013.

LVR-15 reactor SNF is currently stored by the producer (the Research Centre Řež and ÚJV Řež). All the IRT-2M fuel assemblies in the Czech Republic initially enriched to 36% has already been transported to the Russian Federation for reprocessing. No SNF is currently in storage at high-level RAW storage facilities.

[7] SÚJB Annual Report 2013

With regard to the LR-0 research reactor, 68 shortened fuel assemblies of the VVER-1000 type remain available, 32 of which were borrowed from the former Soviet Union. Due to the very low power output of LR-0 reactors, these fuel assemblies are considered to be, to all intents and purposes, fresh fuel with minimum permanent residual activity.

The VR1 educational reactor at the ČVUT (the Czech Technical University in Prague) contained 21 IRT-4M type fuel assemblies enriched to 19.7% ^{235}U as at 31 December 2013.

6.3 Estimate of the future amount of RAW and SNF

Roughly 30 m^3 to 50 m^3 of institutional radioactive waste is produced annually in the Czech Republic and the production of a similar amount of waste is envisaged in the future except for a short period over the following five to ten years in which it is expected to increase due to the remediation of environmental burdens at ÚJV Řež (100 m^3 to 200 m^3/year). In addition, it must be assumed that further extra waste will be produced as a result of decommissioning of research reactors at the Research Centre Řež (LVR-15 and LR-0 reactors), at the Faculty of Nuclear Sciences and Physical Engineering of the ČVUT (VR-1 reactor) and at ÚJV Řež.

One significant uncertainty in terms of making a qualified estimate of the amount of RAW and SNF which will be produced by NPPs in future years is the amount of RAW produced by new nuclear units.

Consequently, future waste production estimates should be updated on a regular basis; the first update concerning waste produced as a result of NPP operation should be performed immediately following the selection of a contractor for the construction of any new nuclear units.

A relatively large amount of waste will be produced as a result of the future decommissioning of nuclear installations. Statistics concerning waste produced as a result of the decommissioning of nuclear installations are regularly updated every five years.

Estimates provided in the following section are based on the current state of knowledge of the technologies employed with a focus on the minimisation of the occurrence of RAW.

6.3.1 Estimate of the future amount of low-level and intermediate-level waste for disposal in near-surface repositories

An estimate of the future expected volume of LILW including an estimate of waste which might be produced by new nuclear units is provided in Table 4. The estimate does not include waste contaminated by natural radionuclides resulting from past environmental burdens, e.g. the remnants of disused production lines, abandoned sludge-drying beds created as a result of coal mining, landfill sites and old factory waste dumps. Such occurrences usually concern huge volumes of waste contaminated by only a small concentration of natural radionuclides.

Table 4: Statistics concerning low-level and intermediate-level waste which meet acceptability criteria for disposal in near-surface repositories (conservative estimate)

Waste type	Volume [m^3]
Waste from NPP operation 60-year lifetime of operational NPPs 60-year lifetime of NJZ	18,300 10,200–23,200 *)
Low-level and intermediate-level waste from NPP decommissioning 60-year lifetime of operational NPPs 60-year lifetime of NJZ	10,800**) 7,200**)
Institutional waste Operational waste (60 years) Waste from past environmental damage and the decommissioning of nuclear installations	2,000 1,500 ***)

*) The estimate of waste production caused by new nuclear units is based on the general requirement for III. generation advanced reactors to produce less than 50 m^3 of processed RAW for 1GW of installed capacity and on data provided by potential NJZ contractors in their design documentation
**) The estimate of waste production is similar for all decommissioning variants.
***) Includes waste from decommissioning at all those facilities with RAW management licences; the statistics on waste originating from past environmental burdens is of a conservative nature, without considering potential release into the environment.

6.3.2 Estimate of the future amount of LILW and HLW to be disposed of in the future deep geological repository

This waste category includes primarily those activated operational materials and objects which are stored throughout the whole period of NPP operation and which will be disposed of during NPP decommissioning (e.g. activated measuring sensors, thermocouples, inserted rods, reactor surveillance samples, absorbers etc.).

Certain RAW arising as a result of NPP decommissioning will be disposed of in the future deep geological repository since it exceeds limit values for radionuclide volume activity; this concerns primarily ^{63}Ni, ^{59}Ni ^{94}Nb,^{14}C and ^{41}Ca occurring in various reactor elements.

Table 5: Statistics concerning waste which cannot be accepted by near-surface repositories

Waste type	Weight [tonnes]
Operational waste from operational NPPs and NJZ (lifetime 60 years)	140

Waste from NPP decommissioning (operational NPPs and NJZ)	4,200
Institutional waste: • from the decommissioning of experimental reactors • currently stored at the Richard repository	 20 64 (189 drums)

6.3.3 Estimate of the future amount of SNF from nuclear plants

An estimate of the future amount of SNF was made as part of the updating of the reference project in 2009.

Data in Table 6 includes SNF production in total including SNF already stored and SNF which it is assumed will be produced by currently operational NPPs over periods of 40 and 60 years and that from NJZ for a period of 60 years.

Table 6: Statistics on SNF to be disposed of in the deep geological repository

Operation period	EDU 1 - 4 (tonnes of HM)	ETE 1, 2 (tonnes of HM)	NJZ (2 + 1) (tonnes of HM)	**In total (tonnes of HM)**
40 years	1,740	1,750	---	3,490
60 years	2,430	2,470	5,010	9,910

The strategy of ČEZ, based on a detailed assessment of technical and economic factors, envisages the possibility of further SNF recycling into the form of MOX fuel for light-water reactors and/or the utilisation of plutonium from SNF reprocessing in IV. generation fast reactors provided that such reactors become commercially available. High-level and intermediate-level waste will have to be disposed of in the deep geological repository.

6.3.4 Estimate of the future amount of SNF from experimental reactors

Low-enriched IRT-4M SNF (enriched to 19.7%) will be generated via the operation of the LVR-15 reactor. It is estimated that a total of 136 IRT-4M fuel assemblies will be generated up to the planned date of reactor closure (2018). Should reactor operation be extended to 2028, the total amount of SNF generated will rise to 286 fuel assemblies.

No increase in the number of LR-0 reactor fuel assemblies (currently 64 VVER 100-type shortened assemblies) or fuel assemblies from the VR 1 educational reactor (currently 21 IRT-4M-type assemblies) is envisaged at present.

7. MANAGEMENT OF LOW-LEVEL AND INTERMEDIATE-LEVEL WASTE

7.1 Management of low-level and intermediate-level waste from nuclear power plants intended for disposal in near-surface repositories

The coolant used in the NPP primary cycle represents a prime source of liquid media activity. The processing of contaminated liquid media is aimed both at concentrating such activity into the smallest possible volume and the consideration of further stages in the RAW management process, primarily conditioning into a form which meets acceptability criteria for a given repository.

Solid RAW is generated mainly during regular reactor outages, routine cleaning and maintenance work, the decontamination of equipment and laboratories etc., and its composition depends on the operating mode of the reactor. One of the basic operations in the solid waste handling process consists of the sorting of the waste so as to determine those solid parts which can be safely released into the environment, provided the criteria of SÚJB Regulation No. 307/2002, Articles 56 and 57 are satisfied.

7.1.1 Collection and sorting

Solid and liquid waste generated in NPP controlled or monitored zones is collected and then sorted based on waste type and activity with a view to the subsequent mode of handling.

Waste water is sorted (and collected in separate tanks) according to the anticipated mode of treatment. Solid waste is collected for sorting at so-called collection points located in a dedicated facility situated within the controlled zone.

Waste which meets the criteria of SÚJB Regulation No. 307/2002, Articles 56 and 57 or the respective water management regulation can be discharged directly into the environment. Waste which cannot be discharged into the environment is handled as RAW in compliance with the respective SÚJB licence.

7.1.2 Processing and conditioning

Proven radioactive water processing technologies are employed: mechanical and ion exchange filtration, sorption, sedimentation, centrifugation and evaporation. Concentrated liquid waste, sludge and spent resins originating from currently operational NPPs are solidified using bitumen or aluminosilicate.

Sorted solid radioactive waste is subjected to further processing involving fragmentation or decontamination and its volume is reduced via the application of low-pressure or high-pressure compression technology. That part of the waste which meets the relevant technical specification criteria of the processing organisation is incinerated at external incinerating plants; contaminated metals can be melted into the form of ingots.

Solid or solidified RAW in 200-litre steel drums is first characterised and subsequently transported to the Dukovany repository for disposal provided it meets acceptability criteria for disposal at the said repository. The technology regarding the treatment and processing of radioactive waste from new nuclear units will depend on the nuclear reactor contractor selected. ČEZ strategy clearly states that criteria concerning RAW minimisation and acceptance for repository disposal will be strictly applied with respect to new nuclear generating units.

7.1.3 Disposal

Operational waste from nuclear plants is disposed of at the Dukovany repository which has been in continuous operation since 1995. The total disposal capacity is 55,000m^3 (approximately 180,000 drums) and is considered sufficient for the disposal of all low and intermediate level waste from the currently operational Dukovany and Temelín power plants.

A comparison of available repository capacity with the anticipated future volume of waste (see Tables 2 and 4), however, reveals that the capacity of currently operational repositories will not suffice for the disposal of waste from new nuclear units. Once estimates of current operational waste production (approximately 400 m^3/year), a planned increase in waste generation from new nuclear units and a further increase in waste arising from the decommissioning of the Dukovany NPP in 2035 are taken into account, it can be predicted that current Dukovany repository capacity will be fully used up by around 2050.

Following the consideration and subsequent evaluation of a number of options, it is anticipated that the future lack of capacity for LILW disposal will be solved e.g. by the extension of the Dukovany repository, the construction of a new repository at a different location or LILW disposal within the future deep geological HLW and SNF repository complex currently in the preparation stage.

Waste which meets criteria for discharge into the environment (SÚJB Regulation No. 307/2002, Articles 56 and 57) can be transferred to the relevant authorised organisations for recycling or disposal.

A considerable amount of waste which cannot be released into the environment but for which the robust engineered solution of a repository is not required for its long-term disposal is generated particularly during nuclear power plant decommissioning. Such RAW can be safely stored at repositories with a similar design to that of secured municipal landfills.

7.2 Management of institutional low-level and intermediate-level waste intended for disposal in near-surface repositories

Ensuring the safe management of institutional RAW, i.e. RAW resulting from the use of ionising radiation in the industrial, health and research sectors, is considerably more complex, primarily due to the large number of producers and the diversity of the institutional waste produced. A total of 140 producers of such RAW are currently registered in the Czech Republic.

The overwhelming majority of institutional waste consists of low-level RAW which can be disposed of in near-surface repositories. Only a small amount of intermediate-level and high-level RAW is stored.

A number of organisations in the Czech Republic currently hold licences for RAW processing or treatment which entitle them to provide this service to other waste producers. Almost 90% of all institutional waste is processed and treated at ÚJV Řež.

Institutional waste is disposed of at the Richard and Bratrství repositories. The Richard repository is located in the Richard II former limestone mine complex (underground, beneath the Bídnice hill). From 1964 to 1992 the repository was operated by ÚVVVR and NYCOM and, subsequently, during the period 1997 to 1999, by ARAO. Since 2000 the repository has been owned by the State and is operated by SÚRAO.

The Bratrství repository, located in one of the abandoned galleries of a former uranium mine has, since 1974, been used for the disposal of waste containing natural radionuclides. The mine is situated in a crystalline rock environment.

Institutional waste can, to a limited extent, also be disposed of in the Dukovany repository provided it meets acceptance criteria for this repository. Two emplacement chambers (approximately 640 m^3) have been allocated for the disposal of institutional waste. Roughly 60 m^3 of institutional waste has been disposed of in the Dukovany repository to date.

As shown in Table 2, the capacity of the Bratrství repository will soon be exhausted; it is expected that the disposal of RAW at the facility will end around 2020. The disposal of waste containing natural radionuclides which, according to current Limits and Conditions, cannot be placed in the Dukovany or Richard repositories must therefore be ensured after this time. Two options concerning the disposal of such waste are available: storage until the commissioning of the planned deep geological repository or the utilisation of the Richard repository should safety analysis prove that it can also be used for the disposal of this category of RAW.

It is envisaged that the current free capacity of the Richard repository available for RAW disposal (Table 2) will be exhausted by 2025, depending on the actual volume of waste produced as a result of the repair of environmental damage at ÚJV Řež. It is possible, however, that further disposal capacity at the Richard repository will be made available by means of the adaptation of access tunnels and other unused space within the repository. In recent years, SÚRAO has adapted a number of excavated spaces at the Richard repository and, based on this experience, assumes that the relevant adaptations will be made within two years of the issuance of the relevant SÚJB licence.

Table 7: Anticipated timetable of Richard repository reconstruction

Development of the project for the reconstruction of the Richard repository as the basic document for an application for SÚJB licensing documentation	2016
Submission to the SÚJB of an application for reconstruction approval	2017
Reconstruction following SÚJB approval and project completion	2018-2019
Submission to the SÚJB of an application for a licence for the operation of reconstructed spaces in the Richard repository and commencement of operation	2020

7.2.1 Management of waste contaminated with natural radionuclides from technological processes

There have been a number of trends in recent years at the international level towards the elimination or reduction of radiation risk to a reasonable level both in relation to the management of artificial radiation sources (the use of nuclear technologies, SNF management etc.) and to the potential risk of exposure to natural sources. Attention has been devoted particularly to those technologies the by-products of which consist of the release or concentration of radioactive substances (the combustion of solid fossil fuels, the extraction, transport and processing of crude oil and natural gas, the processing of phosphate raw materials, the production and processing of materials based on titanium and zirconium, the treatment of sludge from waterworks and the production of metals). Materials whose processing technology leads to a significant increase in the concentration of natural radionuclides are known as NORM (naturally occurring radioactive materials).

Most input raw materials used today are no longer generally associated with the production of NORM-type waste; however, this is not always the case, and was even less so in past years. Hence, NORM-type radioactive materials are exposed from time to time as a result of the liquidation of disused production lines, abandoned sludge-drying beds (the legacy of coal mining activities), chemical plants and landfills and waste dumps in the proximity of closed factory complexes. Materials contaminated with natural radionuclides (usually ^{226}Ra) are often discovered following the detection of scrap metal in scrap yards and at the entrance to iron- and steel-works.

It must be assumed that the discovery of waste contaminated with natural radionuclides will continue in future years. The potential for area screening of the amount and extent of NORM-type waste will be analysed in due course. Various options concerning the management of such waste are currently under consideration: the use of special scrap yards or repositories for very-low-level waste, sludge-drying beds resulting from uranium ore mining and fly ash settling ponds as well as the utilisation of abandoned mines and selected hazardous waste dumps. The results of an ongoing SÚJB project aimed at the identification of methods which might be employed for managing the release of natural radionuclides from facilities at which NORM-type waste is generated (to special dumps, sludge-drying beds, surface water courses, sewerage systems and the atmosphere) including the setting of the relevant acceptability criteria and the construction of models for the assessment of human radiation exposure will be particularly important in terms of determining the ideal method for the management of this type of waste. SÚRAO will employ the results of the project as input material concerning the potential development of a facility for the storage of NORM-type waste.

7.3 Concept and plans for the post-closure period

As stipulated in Article 52, paragraph 2 of SÚJB Regulation 307/2002 on radiation protection, the operation of repositories will be terminated upon their closure. The proposed repository closure method is set out in documentation which forms an annex to the application for the repository operation licence.

The Hostim repository was closed in 1965. Haulageways at the repository were filled with a concrete mixture in 1997 in order to prevent the entry of unauthorised persons. A hydrogeological monitoring system was installed in 1990-1991 and is operated by SÚRAO.

The scope of and timetable governing the institutional control of near-surface repositories are set out in the relevant documentation which has been subjected to SÚJB approval.

7.4 Management of RAW resulting from a potential radiation accident

Though the probability of the occurrence of a radiation accident and the associated release of a relatively large amount of RAW are very low, such a possibility must be considered in the emergency preparedness scheme.

The term “radiation accident” includes a broad spectrum of eventualities which might occur in connection with a nuclear event connected with the use of nuclear energy. The classification and evaluation of the seriousness of nuclear events is specified in INES, the International Nuclear and Radiological Event Scale, which provides a broadly-accepted source of both terminology and technologically accurate information exchange between members of the international nuclear community, the media and the general public. The term “accident” is associated with the highest (4th to 7th) levels of the scale.

The design and operation of all nuclear facilities provide for a sequential switching of safety systems the aim of which is to prevent any significant impact on the facility itself and the surrounding area in case of a nuclear event. Generally, safety systems are designed to correspond to the potential impact of such an event within a particular facility. Only a breach of all the safety systems could potentially lead to significant consequences for the facility and the surrounding area. Protection provided by means of such safety systems is often referred to as “in-depth protection”.

All applicants for nuclear facility operating licences are required by law to submit the respective documentation which includes safety reports containing an overview of model situations relevant in terms of both classification according to the INES rating scale and procedures applicable to the management of waste produced as the result of radiation incidents or accidents. Generally, radioactive substances the unwanted leakage of which might occur within a nuclear facility (i.e. without leakage into the surrounding area) can be processed as RAW by means of static or mobile processing technologies and conditioned into a form which meets acceptance criteria for existing radioactive waste repositories.

In the event of a radiation accident involving the leakage of radioactive substances into the surrounding area, the relevant emergency response organisation will decide which methods should be used for the clearance of radiation contamination in compliance with the emergency plan for the particular nuclear facility. The resulting radioactive waste will be processed so as to meet acceptance criteria for existing radioactive waste repositories. It will be possible to use current RAW treatment and processing technologies for the processing of reasonably foreseeable quantities of RAW which might be produced as the result of a radiation accident. In the case of an extraordinary event, the construction of waste dumps for contaminated material will be considered.

Processed RAW can be disposed of once it is proven to have met radioactive waste repository acceptance criteria. By the end of 2013, 17% of the capacity of the Dukovany repository had been filled; enough free capacity remains at the facility for the disposal needs of the next several decades. Should RAW not meet acceptance criteria for existing radioactive waste repositories, it will be stored at the respective facility and subsequently disposed of in the planned deep geological repository.

7.5 Concept recommendations for objectives and milestones regarding low-level and intermediate-level waste intended for disposal in near-surface repositories

The following review outlines a number of objectives and milestones identified on the basis of an analysis of the current situation regarding the management of low-level and intermediate-level waste in the Czech Republic. The objectives and milestones will subsequently be used as input material for the design of related projects.

Table 8: Concept recommendations and milestones for LIRAW disposal

No.	Objective	Milestone/ Responsible
5	To draw up the documentation required for applying for a licence for Richard repository reconstruction.	2017/SÚRAO
6	To draw up the required documentation for an application for the closure of the Bratrství repository.	2018/SÚRAO
7	To draft a study focused on the potential for the area screening of the amount of NORM in the Czech Republic. If deemed necessary, commencements of work on the preparation of an installation for the disposal of NORM-type waste.	2020/SÚRAO

8. MANAGEMENT OF SNF AND RAW NOT ACCEPTABLE FOR NEAR-SURFACE REPOSITORIES

8.1 Introduction

At the time the first nuclear power plants were being built in the former Czechoslovakia, it was planned that spent nuclear fuel would be transported cost free to the Soviet Union. Following the social and political changes of 1989, however, it soon became evident that SNF would not be dealt with in this way. In 1992 the then Ministry of the Economy was charged with developing a new concept for RAW management including the final disposal of SNF. In early 1994 the Council for the coordination of a solution to deep geological repository development issues (referred to as the Council of six - the Ministry of Industry and Trade, the Ministry of the Economy, ČEZ, the Ministry of the Environment, SÚJB and ÚJV Řež) was established at the instigation of the Ministry of the Economy; the Council subsequently became the primary impulse in the creation of the Czech concept for RAW and SNF management.

The Atomic Act was adopted in 1997 according to which the Radioactive Waste Repository Authority was established and tasked, in addition to assuming responsibility for the operation of near-surface repositories, with drafting the Concept for RAW and SNF management.

The Concept for RAW and SNF management in the Czech Republic was approved by the Government in 2002, by means of Decision No. 487/2002. The Concept declared that the basic strategy of the Czech Republic consisted of the direct disposal of SNF in a deep geological repository planned for commissioning in 2065. Up to the time of the commissioning of the deep geological repository, SNF and RAW not acceptable for disposal in near-surface repositories would be safely stored at the sites of producers. The safety of the future deep geological repository must be proved prior to construction by means of the conducting of long-term experiments in an underground laboratory. The Concept stated that research into advanced SNF reprocessing technologies and the reduction of the volume of waste to be disposed of in the deep geological repository would be supported.

8.2 SNF management options

The following spent nuclear fuel management options can be considered:

1) Zero option (SNF long-term storage);
2) Direct SNF disposal in a deep geological repository in the Czech Republic;
3) SNF reprocessing abroad and the disposal of the remaining waste in a deep geological repository in the Czech Republic.
4) SNF/HLW disposal in an international or regional repository.

Ad 1) Long-term storage does not solve the issue of the final disposal of SNF despite a number of countries considering the storage of SNF for several hundreds of years. According to the Atomic Act and Council Directive 2011/70/Euratom, Article 21 on SNF storage including long-term storage, this is a temporary solution, but not an alternative to disposal.

Ad 2) Direct SNF disposal within the country of origin is the preferred option in a number of European countries (Sweden, Finland and Spain). This variant is currently considered both safe and the most economical solution for the back end of the fuel cycle particularly for those countries which do not have SNF reprocessing plants. Certain countries which initially transferred their SNF abroad for reprocessing have since withdrawn from the relevant contracts and opted for direct disposal (Germany and Switzerland) in connection with the anticipated contraction of their nuclear energy sectors.

Ad 3) Several analyses of the potential for the treatment of SNF conducted over the last decade in the Czech Republic and other countries have proved that very advanced nuclear fuel cycles with IV. generation reactors will be able to substantially reduce the potential danger associated with radioactive waste by removing long-lived minor actinides in addition to plutonium. In addition, such reactors will contribute significantly towards reducing the volume of waste and, consequently, reduce the amount of required capacity of the future deep geological repository. However, this technology will not be capable of removing mobile long-lived fission products and radionuclides occurring due to the activation of impurities in construction materials. A certain amount of waste will always remain, the only solution for which is disposal in a deep geological repository. It should be noted that the final decision concerning IV. generation reactors will be strongly influenced by a range of technical and economic factors and will be subject to the strategic and political interests of individual countries.

The preferred option of ČEZ, the Czech nuclear plant operator, is the direct disposal of SNF in a deep geological repository. It is possible, however, that in the future ČEZ will opt for SNF reprocessing and the use of MOX type fuel. According to current information, from 2018 commercial reprocessing will be available only in

France, the Russian Federation and, possibly, Japan. In the medium term ČEZ intends to investigate the potential for the modification of fuel cycles depending on the commercial implementation of fast reactor technology. The utilisation of reprocessed SNF as fuel in fast reactors would result in a reduction in the volume of waste which needs to be disposed of in the deep geological repository.

Ad 4) Establishing a joint, regional or international, repository which would accept radioactive waste from other countries is a complicated issue for many countries, including the Czech Republic, due to the adoption of legislation which prohibits the import of radioactive waste. According to Council Directive 2011/70/Euratom, the export of spent nuclear fuel is allowed only under strictly-defined conditions. The Directive recognises the possibility of agreement between two or more EU countries on the construction of a joint deep geological repository; however export to countries outside the EU (third countries) would be subject to strict conditions as set out in Directive 2006/117/Euratom.

The option involving the disposal of RAW and SNF produced in the Czech Republic in an international repository is presently considered very unlikely; in addition, it is far from clear whether such a repository would accept all that waste which cannot be disposed of in near-surface repositories (i.e. including institutional RAW). The continuous monitoring of developments in this field is recommended.

8.3 Storage of SNF from power reactors

ČEZ is responsible for the storage of SNF from power reactors in the Czech Republic. ČEZ's basic strategic variant envisages storage of SNF from reactors in spent nuclear fuel cooling pools (over a period of approximately 7 – 10 years) followed by its storage in dry storage facilities (over a period of approximately 40 – 60 years) which are located within the complexes of respective NPPs. ČEZ states in its strategy the intention to declare SNF radioactive waste and to transfer it to SÚRAO for disposal after 2065.

The extension of the operation period of current power generating units and the commissioning of new units will result in an increase in the volume of SNF; consequently, new storage capacity must be prepared. Past experience has proved that the period from the start of preparations to storage facility commissioning amounts to a minimum of 10–15 years; this time period must be considered by the SNF producer in terms of operational planning. Should the construction of new nuclear units be planned, activities concerning the storage of SNF from such units must be launched well in advance.

The technology of long-term dry storage in storage containers has already been internationally proven. The relevant data on SNF behaviour and the development of the properties of storage containers during the storage period has been acquired as a result of the involvement of ČEZ and its subsidiary ÚJV Řež in international programmes as part of which various projects have been prepared and realised aimed at proving the safety of SNF storage over a period of 100 years and more.

Currently operational SNF storage facilities feature so-called service areas where any defects in the sealing of the secondary lids of storage containers can be repaired if necessary. Should repairs need to be made to the primary lid sealing of storage containers or SNF has to be transferred to another container, the relevant transportation and handling technologies are employed. If, at the time existing NPP units are closed, new generating units are in operation at either of the Czech Republic's NPPs, it will be possible to use those new units to resolve such issues provided that the respective technologies and storage containers are compatible. In the event that new power generating units are not constructed, technological equipment for the safe handling of SNF which allow it to be transferred from one storage container to another must be put into operation no later than 12 months prior to the decommissioning of the final generating unit at the relevant site.

It has been calculated that current storage capacity for SNF produced by the EDU generating units currently in operation will be sufficient for 45 years of operation; capacity for the storage of SNF from the currently operational ETE 1 and ETE 2 units will suffice for approximately 30 years of operation. Additional storage capacity will have to be built should the 40-year basic variant be adopted. In the case of the extension of the operation period beyond 45 years, storage capacity will also have to be increased for currently operational EDU units. In the event of the 60-year operation of existing generating units, storage capacity for 1,580 tonnes of HM will have to be ensured. One option put forward in terms of satisfying this requirement involves the construction of this additional storage capacity at the same time as that of storage facilities for the planned ETE 3, ETE 4 and EDU 5 generating units. The required storage capacity for SNF from these three new units, assuming a 60-year operation period, is estimated at 5,010 tonnes of HM.

It is likely that new storage facilities will be situated within existing NPP complexes, however, in the event of space or other constraints, it is possible that the Skalka locality will be used for the construction of a central SNF storage facility. A further alternative involves the possible construction of a central storage facility at the site finally selected for the deep geological repository.

8.4 Disposal of SNF from nuclear reactors

Internationally[8], the disposal of spent nuclear fuel and the high-level waste remaining from reprocessing in a deep geological repository is recognised as the safest method for the management of SNF. It is expected that the operation of the first deep geological repositories in the EU, in Sweden, Finland and France, will commence during the period 2020 to 2025.

[8] Council Directive 2011/70/Euratom

The systematic development of a deep geological repository programme in the Czech Republic began following the termination of a contract which provided for the transportation without charge of spent nuclear fuel to the former Soviet Union in 1989. In 1992 the Czech Geological Institute selected 27 sites deemed potentially eligible for deep geological repository siting. A comprehensive review of available geological data on the selected sites was conducted and eight of the sites were recommended for further research. Subsequently, a summary was made of information available at the time on the expected amount of spent nuclear fuel and other radioactive waste which would have to be disposed of in the future deep geological repository and an analysis was made of basic information concerning waste characteristics, the engineered barriers that would be required and the characteristics of various rock environments. SNF disposal casks were designed based on carbon steel and basic design projects conducted concerning both the underground and above-surface parts of the future deep geological repository, all on the basis of the Swedish KBS-3V concept which envisages that SNF will be disposed of in vertical boreholes at a depth of approximately 500 metres in a granite rock massif in waste packages fitted with copper overpacks and surrounded by compacted bentonite. The first reference project for a deep geological repository at a hypothetical locality within the Czech Republic was developed in 1999 and updated in 2011 to take into account a horizontal emplacement variant according to the Swedish KBS-3H concept.

The updated reference project for a deep geological repository of 2011 envisages the disposal of SNF from NPPs presently under operation, i.e. 4 generating units at the Dukovany NPP and 2 units at the Temelín NPP as well as planned new nuclear units (2 at Temelín and 1 at Dukovany). It is envisaged that SNF produced as a result of the decommissioning of current NPPs and planned NJZ as well as other RAW which cannot be disposed of in near-surface repositories will be disposed of in the deep geological repository.

Following a critical evaluation of the candidate sites in terms of meeting the necessary criteria for the siting of nuclear installations in compliance with SÚJB Regulation No. 215/1997 and possible conflicts with the protection of the environment (under Act No. 114/1992), 11 candidate sites were selected in 2002 in three different rock types[9]. Subsequently, SÚRAO prioritised 6 of the 11 selected sites, all in granitic rock. However, it is necessary to mention at this point that none of the sites which were excluded from the investigation plan in earlier stages of the selection process featured conditions which would have prevented deep geological repository construction.

Evaluations were conducted of transport accessibility, population density and the advantages and disadvantages of siting at all of the six prioritised sites and in 2004 – 2005 geophysical research work was performed in order to reduce the spatial extent of the areas of interest.

[9] in granitoid, metamorphosed and sedimentary rock.

In 2004 the Government accepted, by means of Decision No. 550/2004, the suspension until 2009 of all geological work at the six sites under investigation with a view to deep geological repository siting. The reason for the suspension consisted of the negative attitude of the communities concerned with regard to activities relating to deep geological repository construction. In 2009 the national Land-Use Development Plan, prepared by the Ministry for Regional Development, was approved by Government Decision No. 929 of 20 July 2009 in which (Article 169) the Ministry of Industry and Trade, in cooperation with SÚRAO, was charged with selecting the two most suitable sites for deep geological repository construction by 2015 with the involvement of the communities concerned (this date was originally specified in the Concept of RAW and SNF management in the Czech Republic of 2002).

Following the suspension of work on site selection in the period 2005–2009 and the rescheduling of the approval of the amended Atomic Act (2001), which contains a proposal for the provision of incentives for communities involved in the deep geological repository siting process, it was necessary to amend the completion date for site selection. Consequently, the postponement of the identification of two candidate sites to 2018 was suggested in SÚRAO's Plan of Activities for 2012. The date was subsequently approved by Government Decision No. 955 of 20 December 2012 which charged the Minister of Industry and Trade with selecting two candidate sites for deep geological repository construction by 31 December 2018 and with submitting the respective proposal accompanied by a summary of the positions of the communities concerned to the Government for approval.

It is expected that the postponement of the decision on DGR candidate site selection from 2015 to 2018 and the processing of applications for the identification of investigation areas within the candidate sites to 2020 will not have any direct impact on subsequent timing milestones concerning the siting, design, construction and commissioning of the DGR (see Table 9).

The status of preparation as at the date of the Concept update allows for the selection of the final site in 2025 and the commencement of DGR operation in 2065. The former of the two dates, however, does not include a time reserve and will be met only if geological investigation work progresses smoothly.

Obtaining the consent of communities to their involvement in the DGR site selection process is, despite the offer of financial incentives from the Nuclear Account, far from certain. For this reason and since DGR sites must satisfy a range of demanding criteria, primarily concerning the high level of safety essential for the operation of the future DGR and the stringent requirements involved in determining a technically, economically and sociably acceptable solution, other potential sites are currently being considered. Following an examination of archive geological data, the Kraví hora site in the Vysočina region was added to the list of potential sites; a more positive public attitude concerning DGR investigation work can be expected at this site due to local experience with uranium mining. For the same reasons geological and technical research will be conducted on an ongoing basis focused on determining other potentially suitable sites in those regions in which a more favourable public attitude to DGR construction can be expected due to the local existence of nuclear facilities.

In accordance with Government Decision No. 1315 of 2 October 2008 geological research studies were conducted in the Boletice former military area which resulted in the identification of a potential site at Chlum in the northern part of the Boletice area. Options for the siting of the DGR in sites which were excluded in 2002 will be revised and research will continue with regard to the identification of other areas in the Czech Republic which might be eligible for DGR siting. The study of the Boletice area and the revision of previous research studies are intended as backup solutions to be considered in the event that none of the current candidate sites are deemed eligible.

Site selection will be carried out in several stages during which the number of sites and the surface areas thereof will be gradually reduced. The first stage will involve the revision of available data and the performance of surface geological surveys without encroachment into the Earth’s crust. It is expected that this stage will result in a reduction in the number of potentially eligible sites to be subjected to further detailed geophysical, geochemical, hydrogeological and geotechnical research activities involving the drilling of boreholes (2–4 boreholes to a depth of 500 metres and 1–2 boreholes to a depth of 1,000 metres). The suitability of selected sites will be summarised in the form of detailed safety reports, which will confirm the operational and long-term safety of the repository at the conceptual level, feasibility studies, which will provide an evaluation of both the suitability of the DGR technical solution and the costs of construction at given sites, and studies of both the impact of the DGR on the environment and the anticipated social and economic impacts on local communities and microregions. The following criteria will be used in the systematic assessment of all those sites potentially eligible for deep geological repository siting:

- Safety criteria
- Design criteria
- Environmental criteria
- Social and economic criteria

The involvement of the communities concerned and other stakeholders in the site-selection decision-making process is envisaged in all the stages of deep geological repository development.

Table 9: Presumed timetable for deep geological repository preparation, construction and operation

Research studies aimed at finding further potentially suitable DGR sites including the revision of studies performed before 2002	2016
Selection of two candidate sites based on the preliminary characterisation of the sites, including the position of the communities concerned	2020
Selection of the final site including the position of the communities concerned and submission of an application for land protection at the selected site	2025
Commencement of the EIA procedure for the construction of an underground laboratory at the final site	2026
Submission of an application for planning permission for the underground laboratory at the final site	2028
Commencement of the EIA procedure for DGR construction	2035
Submission of documentation for DGR planning permission to all the institutions concerned including the SÚJB (safety report)	2040
Submission of documentation for building permission	2045
Deep geological repository construction (including the first disposal section) and the drafting of documentation for the commencement of operation	2050–2064
Drafting of documentation for DGR operation authorisation, decision issuance	2063–2065
Commencement of deep geological repository operation	2065

8.5 Disposal of SNF from research reactors

Spent nuclear fuel is also generated as a result of the operation of the LVR-15 reactor operated by the Research Centre Řež. With regard to the operation of other research reactors, e.g. the LR-0 research reactor at the Research Centre Řež and the VR-1 reactor at the ČVUT, no spent nuclear fuel is generated due to their low heat production and short period of operation; slightly irradiated fuel only is generated which will probably be recycled following reactor closure (and used for the production of new fuel) or will be treated as spent nuclear fuel.

SNF from the LVR-15 enriched to more than 20% was previously transported to the Russian Federation for reprocessing according to either the Russian Research Reactor Fuel Return (RRRFR) programme (part of the Global Threat Reduction Initiative – GTRI) or the ÚJV Řež programme for the removal of past environmental burdens. The Czech Republic has since terminated the export of all highly-enriched fuel. Of the Czech SNF currently in the Russian Federation, high-level radioactive waste amounting to roughly 0.74 m^3 of vitrified waste containing fission products and minor actinides will be produced via the reprocessing process. The vitrified waste will be transported back to the Czech Republic in 700-litre casks containing 2 carbon steel canisters (the first portion following 2024 and the second sometime after 2033). This waste will be stored at ÚJV Řež until the future deep geological repository becomes available.

IRT-4M-type spent nuclear fuel (the initial enrichment of fresh nuclear fuel up to 19.7%) will continue to be generated as the result of LVR-15 reactor operation. Following cooling at a wet storage facility, this SNF will be reloaded into ŠKODA VPVR/M transportation-storage containers in which it will be stored at the HLW facility. 16 ŠKODA VPVR/M storage containers with a total capacity of 576 fuel assemblies have been made available for this purpose - more than sufficient for the expected volume of this type of SNF (the final required capacity is expected to be 8 containers).

SNF from the LVR-15 experimental reactor differs significantly from SNF from power reactors both in terms of inventory, geometric dimensions and SNF structural materials. ŠKODA VPVR/M containers allow the safe transportation and storage of all the waste generated by this reactor as well as by the now-closed VVR-S reactor. Subsequently, containers for the waste generated by SNF reprocessing in the Russian Federation will have to be developed, approved and manufactured. It would be beneficial these containers will be of the transportation container type and would meet waste acceptance criteria both for storage and disposal in the future DGR.

Because of the difference between this type of spent nuclear fuel and that from power reactors, data will be required for the safety assessment of its suitability for disposal in the deep geological repository (primarily data on the rate of radionuclide release from the various spent nuclear fuel components under repository conditions).

Spent nuclear fuel from the LR-0 reactor will be stored in dry storage facility No. 212 in storage racks with spacing between the fuel assemblies of no less than 38 cm. Subsequently, the spent nuclear fuel will be gradually transferred from this storage facility to the HLW storage facility at ÚJV Řež where it will be placed separately in containers with stainless steel overpacks; a further option will be spent nuclear fuel storage in separate dry containers. The final disposal options for spent nuclear fuel from the LR-0 reactor consist of:

1) Transfer back to the place of origin (Russian Federation)
2) Disposal in the deep geological repository.

Nuclear fuel from the VR1 educational reactor will, following the start of the decommissioning process, be utilised in the LVR-15 reactor provided that it is still in operation at the time; alternatively, the fuel will be stored at the site of the operator and finally disposed of at the DGR in SNF disposal casks.

8.6 Management of RAW not acceptable in near-surface repositories

8.6.1 Waste from power plant operation and decommissioning

Power plant operation and decommissioning entails the production of waste which cannot be disposed of in near-surface repositories, i.e. certain activated materials stored during the operational period of the respective NPP and a small amount of waste generated during decommissioning (activated measuring sensors, thermocouples, reactor surveillance samples, absorbers, in-core parts, serpentinite concrete, backfill etc.

It is envisaged that this type of waste will be processed during nuclear facility decommissioning so that it can be subsequently accepted by the DGR. Special concrete containers featuring inner and outer steel cladding have been designed for the disposal of this waste. Further research and development into disposal containers will be carried out by SÚRAO in cooperation with waste producers. SÚRAO will specify requirements for disposal containers based on preliminary criteria for repository acceptance, and waste producers will be required to submit initial proposals for the relevant technical and material solutions. Subsequently, based on preliminary safety analysis, additional requirements concerning the disposal containers will be identified. In parallel with the development of disposal containers, it is expected that transportation and handling systems which allow their acceptance, inspection and disposal within designated areas will also be developed.

8.6.2 Institutional waste

Sealed sources provide a typical example of institutional waste which is not acceptable for disposal in near-surface repositories. However, the amount of such waste is expected to gradually diminish since, increasingly, used sealed sources are being returned to their producers for final processing or recycling.

In addition to sealed sources, reactor surveillance samplesfrom the nuclear programme as well as certain LVR-15 research reactor post-closure components will fall into this waste category. With regard to both sealed sources and other types of waste not acceptable at near-surface repositories, treatment methods and disposal containers will have to be developed in order that deep geological repository acceptability criteria are fully met.

Waste not acceptable at near-surface repositories is currently stored by producers or at the Richard repository. Should the Richard repository be closed once it reaches full capacity, it will be necessary to ensure the storage of such waste until such a time as the deep geological repository comes into operation.

8.7 Concept recommendations for the management of SNF and RAW not acceptable in near-surface repositories

The following overview provides Concept recommendations for, and the initial milestones concerning, the management of SNF and RAW not acceptable at near-surface repositories. Short-, medium- and long-term plans for meeting the various objectives have been drafted by SÚRAO and will be published following the approval of the Concept's objectives. An estimate of the funds required for the fulfilment of the said objectives is provided in Chapter 10.

Table 10: Recommendations for the management of SNF and RAW not acceptable at near-surface repositories

No.	Objective	Milestone/ Responsible
8	To ensure the safe storage of SNF, HLW and LILW not acceptable at near-surface repositories until the commissioning of the deep geological repository.	Continuously/ producers, SÚRAO
9	To select at least 2 suitable candidate locations for DGR construction and submitting the result together with the positions of the communities concerned to the Government for approval.	2020/SÚRAO
10	To develop, approve and manufacture transportation-storage containers for vitrified waste from the reprocessing of SNF from the LVR-15 research reactor.	2022/producers
11	To develop the design and safety documentation required for the issuance of a decision on the final site (with community consent) and submission of an application for land protection at the selected site.	2025/SÚRAO
12	Commencement of the construction of an underground laboratory at the final site.	2030/SÚRAO
13	Commencement of the construction of the deep geological repository.	2050/SÚRAO
14	Commencement of deep geological repository operation.	2065/SÚRAO

9. RESEARCH AND DEVELOPMENT

An effective research and development programme is essential in terms of fulfilling the objectives of the Concept for SNF and RAW management. The deep geological repository project is particularly demanding with regard to research and development since repository safety will have to be proved for a period of thousands, even hundreds of thousands of years. The understanding of the processes which may occur within the repository over such a long time period forms one of the most important research objectives. The duration of the project, around 200 years up to and including DGR closure, is significantly longer than that of the average large project; consequently, the education of young specialists, e.g. based on agreements with technical universities and research institutions must be ensured in order to maintain the continuity of the development of the project.

NAPRO (National Programmes), a working group established by the European Nuclear Energy Forum (ENEF) for the drafting of the national programmes of individual EU member countries[10], recommends the following three research and development approaches:

- individual research at the national level required for project implementation;
- joint research activities at the bilateral or international level and the utilisation of joint resources and knowledge, particularly EU research and development framework programmes;
- research based on agreements with countries which have more advanced research programmes.

All these options will be assessed when drafting research and development programmes aimed at satisfying the objectives of the Concept. Clearly, it is possible to adopt the relevant methodologies from other countries; however, the use of the results of experiments conducted in other countries is limited since they depend very much on the geological characteristics of individual DGR sites.

9.1 Research work concerning LILW management

Research and development work related to the safety of low-level and intermediate-level waste management will be closely related to the objectives of the Concept for low-level and intermediate-level waste management shown in Table 7 which concern particularly the safe closure of the Bratrství repository, proving the potential for Richard repository reconstruction and the preparation of new repository construction, primarily for the disposal of waste containing natural radionuclides.

Support will also be provided for the research and development of new methodologies focused on the minimisation of the occurrence, and reduction in the volume, of radioactive waste and improvements concerning waste characterisation. The research support system and project coordination will be agreed between those funding the research, waste producers and SÚRAO.

9.2 Research work concerning RAW and SNF deep geological disposal

Research work concerned with SNF, HLW and LILW intended for disposal in the future deep geological repository and deep geological repository development

[10] Directive 2011/70/Euratom, Article 11

itself will be closely linked to the objectives of the Concept outlined in Table 9. In 2013 SÚRAO drafted its research and development framework programme for the period 2014 to 2020 with an outlook up to 2030 based on these objectives. The framework programme fully complies with Concept objectives and the EU programme for geological waste disposal, part of the IGDP-TP (Implementing Geological Disposal – Technology Platform) platform, which identified the following strategic priority areas regarding research and development which are linked to the vision of the construction of the EU's first deep geological repository by 2025.

Priority area No. 1: Safety case. Each programme must include its own safety assessment methodology which, in turn, includes the preparation of various safety analyses, the testing of modelling tools and the preparation of further arguments aimed at proving and demonstrating deep geological repository safety.

Priority area No. 2: Waste types and behaviour.

Priority area No. 3: Licensing requirements regarding a range of repository components, e.g. disposal containers and backfill materials.

Priority area No. 4: Demonstration of the various technologies involved, e.g. disposal containers, backfill materials, handling and transportation.

Priority area No. 5: Development of a disposal implementation strategy and the monitoring of trends in the field of SNF reprocessing.

Priority area No. 6: Monitoring.

Priority area No. 7: Communication with the public.

The aim of the IGD-TP programme is the fulfilment of the basic vision, i.e. the construction of the EU's first deep geological repository by 2025 and a reduction of uncertainties revealed by research programmes conducted in Sweden, Finland and France. Involvement in research programmes conducted according to the above priority programmes and the obtaining of information on lessons learned over the 40 years or so of deep geological repository development in other EU countries is of prime importance for the Czech Republic, as is the involvement of Czech experts in projects organised by the IAEA and NEA-OECD which include the participation of non-EU countries including the USA, Canada, Japan, South Korea, China and Switzerland.

Research concerned with RAW and SNF disposal will be prepared and conducted in compliance with the Update of the National Strategy for Research, Development and Innovation in the Czech Republic for the period 2009 to 2015 with an outlook up to 2020 (Government Decision No. 294/2013). The coordinating role of SÚRAO as defined in the Atomic Act (Article 26, paragraph 3g) is of great importance in this context. A number of projects, the outcomes of which will potentially be utilised by SÚRAO when addressing SNF and RAW management issues in the Czech Republic have been supported in recent years from funds provided by a number of organisations (MPO, MŽP, TAČR and GAČR). It is recommended that cooperation in terms of research and development be further enhanced in the future.

The research and development programme will focus on improving both the safety and efficiency of RAW and SNF management. The basic priorities of, and Concept objectives regarding research and development are presented in the following overview.

9.3 Concept targets concerning the RAW and SNF management research and development programme

Table 11: Concept targets concerning the research and development programme

No.	Objective	Milestone/ Responsible
15	Regular updating and implementation of the research and development programme for RAW and SNF deep geological disposal in compliance with the timetable for DGR development.	Regularly/ SÚRAO
16	To support projects concerned with the creation of a knowledge base relating to issues regarding minimising the occurrence of radioactive waste, volume reduction and improvements in terms of characterisation, the safe and economically acceptable disposal of RAW and SNF and a closed nuclear fuel cycle for sustainable nuclear power.[11]	Continuously/ MPO
17	To support the systematic preparation and education of specialists in RAW management.	Continuously/ MPO, MŠMT

10. ECONOMIC ASPECTS

Under the provisions of the Atomic Act and in compliance with internationally recognised principles, the costs of radioactive waste management, i.e. costs incurred throughout the period from RAW occurrence up to its permanent disposal, including the costs of post-closure monitoring, are borne by respective producers as are the costs incurred by research and development work. Activities conducted prior to radioactive waste disposal are performed by waste producers or by specialised organisations. In both cases the costs incurred are met by producers. RAW disposal and SNF treatment and disposal are provided by SÚRAO. The level of payments is specified in the respective Government Decision; payments are made to the Nuclear Account.

10.1 Nuclear Account

[11] Basic and applied research focused on the development of new, more efficient fuel cycles which produce a lower amount of RAW is included in the National Research Programme developed as part of the Safe and Efficient Nuclear Power (TP4-DP1) programme. SÚRAO has the statutory obligation to coordinate research activities relating to RAW and SNF management and to reflect the knowledge gained both in the Czech Republic and abroad in its plans for the development of the DGR.

The Nuclear Account was established by the Atomic Act to cover the costs of all activities relating to both RAW and (in the future) SNF disposal.

The Nuclear Account is held at the Czech National Bank (ČNB) and is administered by the Ministry of Finance. Account funds can be utilised solely through SÚRAO to cover the costs of those activities specified in the Atomic Act and included in SÚRAO's plan of activities for the respective year. The administration of funds for RAW and SNF disposal and nuclear installation decommissioning is in compliance with the relevant European Commission Recommendation[12]. Funds are acquired from several sources consisting principally of the following:

- regular or one-off payments by radioactive waste producers based on an evaluation of the costs of activities associated with radioactive waste disposal or spent nuclear fuel processing and disposal;
- revenues from the investment of Nuclear Account funds in the financial markets under conditions specified in the Atomic Act and administered by the Ministry of Finance;
- Nuclear Account interest;
- SÚRAO revenue, grants and payments from abroad (IAEA and EU projects).

The management of Nuclear Account funds is based on the plan of activities approved by the Government and the level of charges and method of payment to the Nuclear Account are determined by Government Regulations.[13] SÚRAO administers payments made into the Nuclear Account and drafts the documentation specifying levels of charges. The value of assets in the Nuclear Account amounted to CZK 21 billion as at the end of 2013.

A substantial proportion of payments into the Nuclear Account are intended for covering the costs of future activities. The methodology for determining the level of charges is based on current prices and takes into consideration estimates of future costs, risks and other relevant factors (e.g. the expected development of the national economy, interest rates and inflation) and respects the Concept for RAW and SNF management. The accumulation of funds in the Nuclear Account is compared at appropriate intervals, at least every five years, with expected future expenditure and, if the amounts are found to differ substantially, the relevant Government Decision is amended.

The rate of valorisation of available funds in the Nuclear Account is of considerable importance in terms both of the overall accumulation of funds in the Account and the determination of the level of charges since a substantial proportion of costs will be incurred over the longer term; in the period 1998–2013 a total of

[12] Commission Recommendation No. 2006/851/Euratom of 24 October 2006 on the management of financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste

[13] Government Regulation No. 416/2002 on the level and method of payments by radioactive waste producers into the Nuclear Account and the annual level of contributions to communities and rules for contribution provision, as amended

CZK 4.18 billion was accumulated, amounting to an average annual interest rate of 2.98%. The current level of charges is set at CZK 50 per MWh(e) generated by nuclear power plants and CZK 15 per MWh(e) generated by research reactors. It is intended that a maximum rate of 1% real valorisation of Nuclear Account funds will be used in the calculation of charges in future years.

10.2 Costs of waste disposal in near-surface repositories

The costs of the operation and closure of existing repositories are paid from the Nuclear Account into which individual waste producers pay contributions depending on the nature and amount of the waste disposed of. The level of charges, both one-off and regular, is determined according to the relevant methodology and is published in the form of a Government Regulation.

Radioactive waste repositories have been in operation for several decades and no funds were reserved for the future costs associated with waste accumulated up to the adoption of the Atomic Act (i.e. repository decommissioning and closure). Hence, the State provides funding for the management of such waste. The State's responsibilities consist of the following:

- the maintenance of underground areas and the repair of technological equipment;
- the monitoring of impacts on the environment both during repository operation and following closure;
- preparations for repository decommissioning – the development of technology concerning the sealing of storage chambers and the closure of individual sections of repositories.

The operational costs of low-level and intermediate-level repositories (Dukovany, Richard and Bratrství) amount to CZK 50–60 million annually and cover disposal, the maintenance of land, buildings, technological equipment and underground areas (Richard and Bratrství), radiation protection, security, fire safety, emergency preparedness and the monitoring of impacts on the environment, as well as SÚRAO's overheads and contributions paid to local communities in whose areas the repositories are located.

An estimate of the costs of low-level and intermediate-level waste disposal for the period to 2050 is presented in Table 12 (in CZK million at 2013 price levels).

Table 12: Overview of the costs of low-level and intermediate-level waste disposal (CZK million)

Repository operation	2,100
Research and development	110
Repository closure	310
Institutional inspection following closure	730
TOTAL COSTS	**3,250**

10.3 Disposal costs associated with spent nuclear fuel and waste not acceptable in near-surface repositories

The costs of the development, construction, operation and closure of the future deep geological repository, the processing of SNF into a form suitable for disposal and the final disposal of SNF and high-level waste will be covered from the Nuclear Account.

Basic technical and economic data used in the evaluation of the costs of a deep geological repository in the Czech Republic was provided in the DGR reference project of 1999 which was updated in 2011. An estimate of the costs of DGR construction and operation (in CZK million at 2011 price levels) is shown in the following table.

Table 13: Estimate of the costs of a DGR (CZK million)

Construction costs in total including R&D	36,700
Operation including repository closure	42,100
Disposal containers	32,600
TOTAL COSTS	**111,400**

Total costs are roughly in accordance with similar estimates in other countries. With a view to the significant proportion of fixed costs in DGR total costs, the unit price per 1 tonne of SNF disposed of is highly dependent on the total amount of SNF deposited. If a relatively high amount of SNF is disposed of (e.g. from the operation of new nuclear power sources), unit disposal costs will be correspondingly lower. The costs of alternative SNF management options (e.g. SNF processing and the disposal of vitrified HLW) would be significantly higher.

10.4 Accumulation of financial reserves for decommissioning

Licence holders are obliged (according to the Atomic Act, Article 18, paragraph 1h) to create financial reserves for the future decommissioning of their nuclear facilities or other facilities containing significant or very significant ionising radiation sources. Funds must be accumulated for future decommissioning purposes in the required amount and in a timely manner in compliance with timetables approved by the SÚJB and according to the decommissioning technology to be utilised. Decommissioning costs must be verified by SÚRAO, as stipulated by the Atomic Act, Article 26, and licence holders are obliged to update their estimates every five years as required by the relevant Regulation so as to reflect price level changes over the past five-year period. An overview of the amount of decommissioning reserves is provided in Table 14 (in CZK million at price levels valid for the year in which the updated estimate was drawn up).

Table 14: Overview of decommissioning costs (CZK million)

Decom. reserve for the Dukovany NPP (2012)	22,355
Decom. reserve for the Temelín NPP (2009)	14,579

Decom. reserve for SNF storages (2010)	46
Other decommissioning reserves (2012)	470

10.5 Concept recommendations concerning the economic aspects of waste management

Table 15: Concept objectives concerning economic aspects

No.	Objective	Timescale / Responsible
18	To assess payments into the Nuclear Account and the utilisation of Account funds. To amend, if required, the Government Decision on the level of payments to the Nuclear Account so as to maintain a balance between Account income and expenditure.	Regularly SÚRAO, MPO
19	To ensure the valorisation of available funds in the Nuclear Account in compliance with the Atomic Act and other legal regulations.	Continuously/ MF
20	To conduct regular inspections of the accumulation of financial reserves for nuclear plant decommissioning with the aim of ensuring sufficient funds for this purpose.	Regularly/ SÚRAO

11. CONCLUSIONS

In order to duly meet the objectives of the Concept for RAW and SNF management, suitable conditions must be provided on a continuous basis, namely:

- to maintain an organisational framework for RAW and SNF management – the Concept is presented and its fulfilment promoted and monitored by the MPO whose expert guarantor consists of SÚRAO supported by technical universities, research and engineering organisations;
- to inspect the funding of activities – the basic source of funds is made up of payments by RAW and SNF producers accumulated in the Nuclear Account and appropriately valorised; the State will participate in covering those liabilities specified by the Atomic Act;
- to maintain and further develop expert and research capacities including the university training of experts – a basic expert structure has been established and will be adjusted to address issues as they appear going forward;
- to ensure public awareness and involvement – the public will be kept informed on various activities relating to RAW and SNF management as required by legislation and this Concept, and suitable conditions for the exchange of information and public participation will be created;
- to foster international cooperation – contact with foreign countries is used for verifying the various methodologies employed and for acquiring technologies and information, particularly with reference to programmes

and projects conducted under the auspices of respected international organisations (EU, IAEA and NEA/OECD).

11.1 Tools for Concept implementation

The Concept defines the following objectives and milestones with respect to RAW and SNF management for the period to 2030:

Table 16: Summary of objectives and milestones with respect to RAW and SNF management

No.	Objective	Milestone/ Responsible
Objectives for communication with the public		
1	To ensure the continuity, transparency and openness of information concerning RAW and SNF management.	Continuously/ SÚRAO, SÚJB, producers
2	To ensure both the independence, and the extension of the range of activities, of the Working Group for Dialogue on the Deep Geological Repository and the creation of a framework for establishing local working groups at individual sites under the umbrella of the current Working Group for Dialogue.	2014/SÚRAO, MPO
3	To discuss draft legislation for the strengthening of the position of local communities in the deep geological repository siting process and submission to the Government for approval.	2015/SÚRAO, MPO, the Government
4	To develop a long-term programme for partnerships between SÚRAO and those communities impacted by DGR development and operation.	2015/SÚRAO
Objectives for low-level and intermediate-level waste management		
5	To draw up the documentation required for applying for a licence for Richard repository reconstruction.	2017/SÚRAO
6	To draw up the required documentation for an application for the closure of the Bratrství repository.	2018/SÚRAO
7	To draft a study focused on the potential for the area screening of the amount of NORM in the Czech Republic. If deemed necessary, commencements of work on the preparation of an installation for the disposal of NORM-type waste.	2020/SÚRAO
Objectives for the management of SNF and RAW not acceptable in near-surface repositories and for the development of the deep geological repository		
8	To ensure the safe storage of SNF, HLW and LILW not acceptable at near-surface repositories until the commissioning of the deep geological repository.	Continuously/ producers, SÚRAO

No.	Objective	Milestone/ Responsible
9	To select at least 2 suitable candidate locations for DGR construction and submitting the result together with the positions of the communities concerned to the Government for approval.	2020/SÚRAO
10	To develop, approve and manufacture transportation-storage containers for vitrified waste from the reprocessing of SNF from the LVR-15 research reactor.	2022/producers
11	To develop the design and safety documentation required for the issuance of a decision on the final site (with community consent) and submission of an application for land protection at the selected site.	2025/SÚRAO
12	Commencement of the construction of an underground laboratory at the final site.	2030/SÚRAO
13	Commencement of the construction of the deep geological repository.	2050/SÚRAO
14	Commencement of deep geological repository operation.	2065/SÚRAO
Objectives for the research and development programme		
15	Regular updating and implementation of the research and development programme for RAW and SNF deep geological disposal in compliance with the timetable for DGR development.	Regularly/SÚRAO
16	To support projects concerned with the creation of a knowledge base relating to issues regarding minimising the occurrence of radioactive waste, volume reduction and improvements in terms of characterisation, the safe and economically acceptable disposal of RAW and SNF and a closed nuclear fuel cycle for sustainable nuclear power.[14]	Continuously/ MPO
17	To support the systematic preparation and education of specialists in RAW management.	Continuously/ MPO, MŠMT
Economic objectives		
18	To assess payments into the Nuclear Account and the utilisation of Account funds. To amend, if required, the Government Decision on the level of payments to the Nuclear Account so as to maintain a balance between Account income and expenditure.	Regularly/ SÚRAO, MPO
19	To ensure the valorisation of available funds in the Nuclear Account in compliance with the Atomic Act and other legal regulations.	Continuously/ MF
20	To conduct regular inspections of the accumulation of financial reserves for nuclear plant decommissioning with the aim of ensuring sufficient funds for this	Regularly/ SÚRAO

[14] Basic and applied research focused on the development of new, more efficient fuel cycles which produce a lower amount of radioactive waste is included in the National Research Programme as part of the Safe and Efficient Nuclear Power (TP4-DP1) programme. SÚRAO has the statutory obligation to coordinate research activities relating to RAW and SNF management and to reflect knowledge gained both in the Czech Republic and abroad in deep geological repository development plans.

No.	Objective	Milestone/ Responsible
	purpose.	

11.2 Risks entailed in fulfilling Concept objectives

The objectives identified above can be achieved only if the basic preconditions of the Concept are satisfied. Certain risks exist, however, which might render the achievement of the set objectives difficult or lead to delays. It is important to mention the following risks in this context:

- time delays in the site selection process for the deep geological repository (public opposition, delays due to administrative procedures);
- time delays in building additional storage capacity for SNF created by the extended operation of nuclear power plants and from new nuclear power sources (more lengthy administrative proceedings);
- time delays in the realisation of additional capacities for the disposal of low-level and intermediate-level waste (selection of the locality and administrative proceedings) and for the storage of RAW not acceptable in near-surface repositories;
- changes in the long-term strategy relating to the utilisation of nuclear power sources.

In order to reduce the said risks and the probability of their occurrence, those basic conditions which have an impact on the Concept's objectives must be monitored and analysed on a continuous basis. The relevant preventative and corrective measures must be taken in a timely manner, if appropriate.

11.3 Assessment of fulfilling Concept objectives

An assessment of the extent to which the Concept has been fulfilled is envisaged sometime after 2025 or following a decision on the construction of new nuclear sources, whichever is the sooner. The assessment will be based on a detailed evaluation of the fulfilment of Concept objectives and on a detailed analysis of the current situation with regard to RAW and SNF management in the Czech Republic.

The fulfilment of Concept objectives will be reported on a regular basis to the Czech Government in compliance with Council Directive 2011/70/Euratom and the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

12. ANNEXES

12.1 Annex 1: Comparison of the Chapters of the Concept with certain paragraphs of Article 12/1 of Council Directive 2011/70/Euratom

Article of Council Directive 2011/70/Euratom	**Concept Chapter**
Article 12/1 a) – Overall objectives of the national policy	Chapter 2 – The Concept's main principles (Objectives of national policy based on the Atomic Act)
Article 12/1 b) – Milestones and timetable of the RAW management programme	Chapter 7.4 – Concept recommendations for LILW management objectives and milestones Chapter 8.8 – Concept recommendations for SNF and HLW management objectives and milestones
Article 12/1 c) – RAW/SNF inventory	Chapter 6.2 – RAW and SNF inventory
Article 12/1 d) – Concept and plan for technical solutions	Chapter 7 – LILW management Chapter 8 – SNF and HLW management
Article 12/1 e) – Concept and plan for the post-closure period	Chapter 7.3 – Concept and plans for the post-closure period
Article 12/1 f) – Research & development and demonstration	Chapter 9 – Research and development
Article 12/1 g) – Responsibility for national plan implementation and success indicators	Chapter 4 – Responsibility for the implementation of the Concept for SNF and RAW management
Article 12/1 h) – Costs estimate	Chapter 10 – Economic aspects
Article 12/1 i) – Funding scheme (and Article 9)	Chapter 10 – Economic aspects
Article 12/1 j) – Transparency of information on RAW management (and Article 10)	Chapter 5 – Communication with the public
Article 12/1 k) – International cooperation in the field of RAW management	Chapter 2.2 – International agreements

12.2 Annex 2: Assessment of the fulfilment of the 2002 Concept

a) Legislation

Objective	Timescale	Current situation
Harmonising of the Atomic Act and relevant secondary legislation concerning RAW management with respective EU legislation.	2002	Fulfilled; the transposition of new EU Directives into Czech legislation is conducted on a regular basis

b) Management of low-level and intermediate-level RAW

Objective	Timescale	Current situation
Maintaining the operability of existing near-surface repositories in compliance with radiation protection and nuclear safety criteria and with the respective SÚJB and ČBU licences.	Continuously	Being fulfilled on a continuous basis
Coordinating and implementing a research programme focused on the minimisation of the volume of radioactive waste produced and developing new methods for radioactive waste processing and treatment.	Continuously	Being fulfilled on a continuous basis – improvements in the coordination of research & development is addressed in the Concept update (Chapter 9)
Drafting a timetable for the closure of those parts of the Richard and Bratrství repositories in which radioactive waste was disposed of before the Atomic Act came into force.	2003	Being fulfilled – addressed in the Concept update (Chapter 7)
Creating the conditions necessary for the application of a SÚRAO coordinated centralised system for the processing and treatment of radioactive waste generated by producers outside the nuclear energy sector (small producers).	2003	Services are provided by several organisations on the basis of commercial contracts
Ensuring the availability of sufficient storage capacity for radioactive waste not acceptable in existing near-surface repositories.	2004	Radioactive waste which is not stored by producers is stored in the Richard repository (see Chapter 7)

c) Management of spent nuclear fuel and high-level waste

Objective	Timescale	Current situation
Constructing of SNF storage facilities	2005	Fulfilled

Objective	Timescale	Current situation
as required by Government Decisions No. 121/1997 and No. 695/2001.	onwards	
Supporting and coordinating the involvement of research institutions in the development of new technologies for SNF reprocessing and transmutation and applying all the tools available in order to reduce the level of risk of high-level waste and spent nuclear fuel.	Regularly	Fulfilled – improvements in the coordination of research & development are addressed in the Concept update (Chapter 9)
Finding sites with the most suitable geological parameters whilst meeting criteria for the sustainable development of the area concerned.	2015	Will not be fulfilled due to the unfavourable attitude of local communities towards DGR construction and the subsequent decision to suspend investigation work in the sites concerned for 5 years
Demonstrating the eligibility of one site for deep geological repository siting based on geological studies and the evaluation of the results.	2025	Addressed in the Concept update
Preparing all the design and supporting documentation required for the commencement of underground laboratory construction and for long-term experiments designed to demonstrate and prove deep geological repository safety.	2030	Not current since the repository locality in which the underground laboratory will be situated has not yet been selected
Deep geological repository commissioning.	2065	

d) Economic aspects

Objective	Timescale	Current situation
Assessing of payments to the Nuclear Account and the utilisation of Account funds. Amending, if required, the Government Decision on the level of payments to the Nuclear Account so as to maintain a balance between Account income and expenditure.	Regularly	Being fulfilled on a regular basis
Ensuring the valorisation of available funds in the Nuclear Account in compliance with the Atomic Act and other legal regulations.	Continuously	Being fulfilled on a regular basis
Conducting regular inspections of the	Regularly	Being fulfilled on a regular

accumulation of financial reserves for nuclear plant decommissioning with the aim of ensuring sufficient funds for this purpose.		basis

e) Other

Objective	**Timescale**	**Current situation**
Regularly and objectively informing the public on RAW management issues (information centres, brochures, the internet etc.).	Continuously	Being fulfilled on a regular basis
Ensuring the independent scientific and technical support of SÚRAO's Supervisory Board for the assessment of the progress of, and work conducted in connection with, the programme for deep geological repository development.	2002	Being fulfilled – the improvement of the coordination of research & development is addressed in the Concept update (Chapter 9)

12.3 Annex 3: Comparison of the current Czech RAW classification system with that of the IAEA

Current Czech classification according to Regulation No. 307/2002	**IAEA classification according to GSG-1**	**Minimum requirement for final emplacement**	**Notes**
	Releasable waste	Outside nuclear legislation (storage – recycling)	
Transition waste	Very short-lived waste	Storage until waste radioactivity is lower than clearance levels and the waste can be released into the environment	Radionuclides decay below clearance levels within a maximum of 5 years
Low-level and intermediate-level waste	Very low-level waste	Secured storage	Storage facility licensed for VLLW disposal
	Low-level waste	Near-surface repository	
	Intermediate-level waste	Underground repository	Minimum depth tens of metres beneath the surface
High-level waste	High-level waste	Deep geological repository	At a depth of several hundreds of metres beneath the surface

12.4 *Annex 4: Related legislation*

Basic Czech legislation

- Act No. 18/1997 Coll. on the peaceful uses of nuclear energy and ionising radiation (the Atomic Act) and on amendments and additions to related Acts, as amended;
- Act No. 183/2006 Coll. on land use planning and the building code (Building Act), as amended;
- Act No. 62/1988 Coll. on geological work, as amended;
- Act No. 44/1988 Coll. on the protection and use of mineral resources (Mining Act), as amended.

Further Czech legislation

- Act No. 100/2001 Coll. on environmental impact assessment and on the amendment of certain related Acts, as amended;
- Act No. 128/2000 Coll. on local municipalities, as amended;
- Act No. 129/2000 Coll. on Czech regions, as amended;
- Act No. 500/2004 Coll., the Administrative Procedure Act, as amended;
- Act No. 89/2012 Coll., the Civil Code, as amended;
- Act No. 114/1992 Coll. on nature and landscape protection, as amended;
- Act No. 254/2001 Coll., on water resources and on the amendment of certain related Acts (the Water Act), as amended;
- Act No. 13/1997 Coll. on the road network, as amended;
- Act No. 266/1994 Coll. on the railway network, as amended;
- Act No. 22/2004 Coll. on local referenda, as amended;
- Act No. 118/2010 Coll. on regional referenda and on the amendment of certain related Acts, as amended;
- Act No. 123/1998 Coll. on the right to information on the environment, as amended;
- Act No. 106/1999 Coll. on free access to information, as amended;
- Act No. 61/1988 Coll. on mining operations, explosives and the State Mining Administration, as amended;
- Act No. 157/2009 Coll. on mining waste and on the amendment of certain related Acts, as amended.

International conventions

- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management; Government Decision No. 593 of 25 September 1997 approved the Czech Republic's joining the Convention with effect from 18 June 2001;
- National report on the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management; available at www.sujb.cz;

- Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters; communication No. 124/2004 Coll.;
- Espoo Convention – Convention on Environmental Impact Assessment in the Transboundary Context; communication No. 124/2004 Coll.

Programme documents

- Land-Use Development Plan of the Czech Republic of 2008; available at www.mmr.cz;
- State Energy Concept; available at www.mpo.cz.

Important Regulations and Government Decisions

- SÚJB Regulation No. 215/1997 Coll. on criteria for the location of nuclear installations and very significant ionising radiation sources;
- SÚJB Regulation No. 307/2002 Coll. on radiation protection, as amended;
- MPO Regulation No. 360/2002 Coll. determining the method of the creation of financial reserves for the decommissioning of nuclear facilities and 3rd and 4th category workplaces;
- Government Decision No. 416/2002 Coll. on the level and method of payments by radioactive waste producers to the Nuclear Account and the annual level of contributions to communities and the rules for contribution provision, as amended.

Further EU legislation (not legally binding)

- Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste;
- Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations;
- Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation;
- Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel;
- Council Directive of 27 June 1985 (85/337/EEC) on the assessment of the effects of certain public and private projects on the environment (EIA);
- Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EC on the assessment of the effects of certain public and private projects on the environment (EIA);
- Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (SEA);
- Commission Recommendation 2006/851/Euratom of 24 October 2006 on the management of financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste.

More detailed explanation of certain selected legislative provisions

Atomic Act (No. 18/1997 Coll.)

Act No. 18/1997 on the peaceful uses of nuclear energy and ionising radiation (the Atomic Act) and on amendments and additions to related Acts, as amended, defines both methods to be employed with regard (and conditions relating) to the use of nuclear energy and ionising radiation and activities entailing radiation exposure, and sets out requirements concerning the safe management of radioactive waste.

For the purposes of this Act, radioactive waste is defined as substances, items or equipment containing radionuclides or contaminated by radionuclides the further use of which is not envisaged. The administration, supervision and control of the use of nuclear energy and ionising radiation is performed on behalf of the State by the State Office for Nuclear Safety whose responsibilities involve the supervision and control of nuclear safety, physical protection, radiation protection, emergency preparedness and the technical safety of selected facilities. The Office also monitors the fulfilment of obligations set out by the Act, defines conditions, requirements, limits, maximum values, highest permissible values concerning the radioactive contamination of food, guidance values, optimising limits, reference levels and diagnostic reference levels and provides information to municipalities and regional authorities on radioactive waste management within their territory of administration when requested to do so.

The Atomic Act states that: Nuclear energy and nuclear items shall be used, in compliance with international commitments made by the Czech Republic, only for peaceful uses. Anyone who utilises nuclear energy or performs activities leading to radiation exposure or intervention aimed at reducing exposure to natural sources or exposure due to radiation accidents must ensure that their actions are justified in terms of the benefits outweighing the risks arising, or liable to arise, from their actions. Anyone who performs practices related to the use of nuclear energy or radiation shall act in such a manner that nuclear safety and radiation protection are ensured as a matter of priority. Anyone who utilises nuclear energy or performs radiation activities leading to radiation exposure, prepares or performs intervention measures to reduce the likelihood of emergency situations involving lasting or natural exposure must maintain such a level of nuclear safety, radiation protection, physical protection and emergency preparedness that the risk to human life, health and the environment shall be kept as low as reasonably achievable, economic and social factors being taken into account.

Anyone involved in radioactive waste management shall take into consideration all the related physical, chemical and biological properties thereof which might have an impact on waste management safety. Owners of radioactive waste or other natural or legal persons who manage the assets of an owner in such a manner that radioactive waste is produced (hereinafter the “producer”) shall bear all costs associated with its management, from time of origin to its final disposal, including the monitoring of radioactive waste repositories following their closure and related research and development activities.

The State is responsible, under conditions specified in this Act, for the safe disposal of all radioactive waste including the monitoring and inspection of repositories following their closure.

SÚJB Regulation on radiation protection (No, 307/2002 Coll.)

The Regulation specifies the scope and method to be employed in the management of ionising sources and radioactive waste and the release of radionuclides into the environment for which an SÚJB licence is required, provides detailed instructions concerning radiation protection measures and sets out a number of radioactive waste categories.

Radioactive waste falls into three categories: gaseous, liquid and solid. Solid radioactive waste can be further divided into three sub-categories, namely transition, low- and intermediate-level, and high-level waste. These categories are fully in compliance with the recommendations of the International Atomic Energy Agency and correspond to three principal management methods: storage until it decays naturally, the surface or sub-surface disposal of short-lived radioactive waste and the deep geological disposal of long-lived and high-level radioactive waste.

Joint Convention on the Safety of SNF and RAW Management (No. 3/2012 Coll.)

The objective of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management is to achieve and maintain a high level of safety in the said activities by means of strengthening national measures and international cooperation. To this end basic safety requirements and safety requirements concerning the siting, design, construction, operation and decommissioning of nuclear installations are defined. The fulfilment of the Convention is assessed at regular meetings held every three years. The Convention confirms that the final responsibility for safety in terms of the management of spent nuclear fuel and radioactive waste lies with the State.

Act on environmental impact assessment (No. 100/2001 Coll.)

This Act establishes rules, in compliance with European Communities legislation, for the assessment of impacts on the environment and human health (EIA) involving activities conducted by natural and legal persons and state and local (municipal and regional) authorities in the process. The Act stipulates that: *Anyone is entitled to submit in writing to the appropriate authority his/her position on the relevant project plan within 20 days of the release of information on the said project plan. Anyone is entitled to send in writing to the appropriate authority his/her position* *on the documentation within 30 days of the release of information on the documentation.*

Unlike a number of other procedures, the EIA process has one significant advantage in terms of the involvement of local people and communities since anyone can choose to be involved in the process by means of submitting a written position or by participating in public hearings. The meeting of the relevant statutory deadlines is the only condition attached to participation. Should the respective authority receive an unfavourable written submission on the relevant project documentation or on an opinion drafted by an authorised person, it is obliged to organise a public hearing at which those interested are invited to express their position on the documentation and the opinion. The discussion is recorded and published on the internet. Should the person who filed the submission or the person who prepared the documentation or the opinion not be present at the public hearing, the authority is entitled to terminate the public hearing and set a new hearing date.

Aarhus Convention (No. 124/2004 Coll.)

The Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters was concluded at a conference on the environment in Aarhus (Denmark) on 25 June 1998 attended by Ministers from the region of the UN European Economic Commission.

The Aarhus Convention makes up an important international agreement which declares the right to enjoy a healthy environment and supports the democratic process. The Convention stipulates that the general public should constitute a partner for the public administration system and, consequently, should enjoy the following rights concerning environmental matters:

- the right to information, the right to know – the provision of information on request (passive right to information);
- the right to participate in the decision-making process – public participation in decision-making on certain activities, namely relating to the permission procedure with respect to selected structures and activities;
- the right to judicial protection – the right to access to judicial protection with concern to environmental issues.

A number of legal regulations of the European Communities are associated with the Aarhus Convention, e.g.: Council Directive No. 2003/4/EC on public access to environmental information and public participation in the decision-making process, and Directive No. 2003/35/EC on public participation in the preparation of various plans and programmes related to the environment. The latter Directive, in those parts relating to public involvement and access to judicial protection, supplements and harmonises Directive 85/337/EEC on the assessment of project impacts on the environment (EIA) and Directive 2008/1/EEC on the integrated control of pollution caused by industrial installations (IPPC).

Building Act (No. 183/2006 Coll.)

With regard to land-use planning, the Act primarily defines the tasks and objectives of the land-use planning process, the system employed by land-use planning authorities, the tools employed in land-use planning, the system governing the assessment of impacts on regional sustainable development, the local decision-making process, the potential for combining procedures specified in this Act with EIA procedures, conditions applicable to construction projects, overall regional development and public infrastructure considerations, the maintaining of records of land-use planning proceedings and land-use planning qualification requirements. As far as the Building Code is concerned, the Act sets rules for the granting of building permission and changes thereto, land re-shaping, the usage and removal of buildings, supervision by and special powers accorded to building authorities, the status and authorisation of buildings inspectors, the overall system governing building authorities and the obligations and responsibilities of the various parties concerned during the preparation and construction of building projects.

The aim of land-use planning is to create conditions which allow both for the realisation of construction projects and the sustainable development of the local area, i.e. the determination of the ideal balance between conditions favourable for the environment, economic development and the social cohesion of communities in the area; in other words, local development which satisfies the needs of the present generation without jeopardising the quality of life of future generations. Land-use planning creates conditions for sustainable development aimed at achieving harmony between public and private interests with concern to area development. In this connection land-use planning monitors the social and economic potential of specific development projects. Moreover, land-use development policy determines, with regard to specific time periods, requirements for the detailed specification of land-use planning targets in the national, cross-border and international contexts, particularly with regard to the sustainable development of the area, and determines the strategy and basic conditions for meeting such targets.

The draft land-use plan will be discussed via public hearings at which all those interested will be invited to present their comments and objections.

The construction of buildings and other structures, changes thereto, changes in terms of their impact on local land use and the protection of important interests within a given area are only possible following the issuance of a land-use decision or land-use approval, unless the Act stipulates otherwise. The parties involved in planning permission proceedings consist of the applicant, the municipality in which the planned project is to be realised, the owner of the land on which the project is to be constructed, provided that the owner is not the applicant or a person who has another real property right to the land or facility, persons whose right of ownership or other real property rights to neighbouring buildings or land or buildings situated on such land might be affected by the land-use decision, and persons whose participation is defined by means of a special legal regulation.

Act on geological work (No. 621/1988 Coll.)

The Act stipulates conditions for the design, execution and subsequent evaluation of geological work, the coordination and inspection thereof and the utilisation of the results with regard to the national economy, science and technology. The Act distinguishes between geological research (research of the occurrence and activity of geological processes accompanied by the research, evaluation and documentation of an area's geological structure and its various elements) and geological investigation work (deliberately targeted geological work aimed at the investigation of an area which exceeds geological research). Geological work concerning the investigation and prospecting of deposits of reserved minerals and exclusive deposits of non-reserved minerals can be conducted only within a defined investigation area (investigation area for intrusion into the Earth's crust). Applications for the identification of an investigation area are submitted to the Ministry of the Environment. The parties involved in the proceedings consist of the applicant, the local municipality in which the planned investigation area or part thereof is situated and those persons whose participation is defined in the form of a special legal regulation.

Mining Act (No. 44/1988 Coll.)

The Act sets out principles regarding the protection and economic utilisation of mineral resources, particularly as relates to prospecting and exploration, mine opening, the preparation and extraction of mineral deposits and the processing and refinement of the minerals following extraction, as well as concerning operational safety and environmental protection whilst such activities are being performed.

The construction of facilities for underground radioactive waste disposal is defined in the Act as intrusion into the Earth's crust. Only that organisation which submits a proposal participates in the proceedings for the identification of a protected area for intrusion into the Earth's crust. The decision on area identification is made by the Ministry of the Environment in coordination with the Ministry of Industry and Trade and the relevant regional mining authority and following agreement from the relevant land-use planning and building authorities.

Mining Operations Act (No. 61/1988 Coll.)

The Act defines conditions for the conducting of mining operations, conditions for the handling of explosives and explosive items, conditions for the safe operation of underground facilities and the scope of powers accorded to state mining authorities.

Pursuant to the Mining Operations Act, a deep geological repository is considered a mine working. Mining operations are understood to constitute, among other things, intrusion into the Earth's crust, i.e. activities aimed at the construction and operation of installations for radioactive waste disposal.

A permit issued by the relevant regional mining authority must be obtained prior to the conducting of mining operations. In the event that buildings and other interests protected by law are threatened, applications for a mining licence must be accompanied by “documentation on resolving conflicts of interest”. The parties involved in administrative proceedings for a mining licence consist of the applicant, the investor, the mine working owner, local inhabitants whose rights and protected interests or obligations might be affected by the granting of the licence, and the local municipality in which mining operations are to be conducted.

12.5 Annex 5: References

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