

THE CZECH REPUBLIC NATIONAL REPORT

under
the Joint Convention on the Safety of Spent Fuel Management
and on the Safety of Radioactive Waste Management

Praha 2020



National Report under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

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Note: Substantial changes in the current version of the National Report, except numerical values (such as inventories, budgets,...), are highlighted in grey.

List of abbreviations and selected terms

Atomic Act	Act No. 263/2016 Coll., of 14 July 2016, Atomic Act
BAPP	Auxiliary Service Building
CV Řež	Centrum výzkumu (Research center) Řež s. r. o.
ČSKAE	Czechoslovak Atomic Energy Commission
DGR	Deep Geological Repository
Directive	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
EC	European Commission
EDU/NPP Dukovany	ČEZ, a. s., Nuclear Power Plant Dukovany
ENATOM	Emergency Notification and Assistance Technical Operations Manual
ENSREG	European Nuclear Safety Regulators Group
EOAR	equivalent volume activity of radon
ETE/NPP Temelín	ČEZ, a. s., Nuclear Power Plant Temelín
EU	European Union
FA	fuel assembly
FDC	Fragmentation and Decontamination Center
FJFI ČVUT	Faculty of Nuclear and Physical Engineering, Czech Technical University in Prague
GTRI	Global Threat Reduction Initiative
HAW	higher active waste (ie. L+ILW not complying with WAC for disposal)
HLW	high level waste
HM	heavy metal
HVB	Main Production Building
IAEA	International Atomic Energy Agency
ICRP	International Committee for Radiation Protection
ILW	Intermediate Level Waste
INES	International Nuclear Event Scale
IPDP	Individual Personal Development Plan
IRRS	International Regulatory Review Service
IRRT	International Regulatory Review Team
IRS	Incident Reporting System
ISFSF	Interim Spent Fuel Storage Facility (Dukovany)
JAVYS, a. s.	Jadrová a vyradovacia spoločnosť, a. s., Jaslovské Bohunice, Slovakia
Joint Convention	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
keff	effective coefficient of neutron breeding
LLW	Low Level Waste
LVR	light water reactor
MF	Ministry of Finance of the Czech Republic
MMR	Ministry of Regional Development of the Czech Republic
MPO	Ministry of Industry and Trade of the Czech Republic
MUNI	Masaryk University in Brno
MV	Ministry of the Interior of the Czech Republic

MZd	Ministry of Health of the Czech Republic
MŽP	Ministry of the Environment of the Czech Republic
National Report	National Report of the Czech Republic under the Joint Convention on Safety in Spent Fuel Management and e Safety in Radioactive Waste Management
NATO	North Atlantic Treaty Organization
NEA/OECD	Nuclear Energy Agency/Organization for Economic Co-operation and Development
NPP	nuclear power plant
NSC	National Security Council
OLC	operational limits and condition
PE	polyethylene
Policy	Policy for Radioactive Waste Management and Spent Fuel Management in the Czech Republic approved by the Czech government Resolution No. 487 of 15 May 2002 and its updates, approved by the Czech government Resolutions No. 852 of 29 November 2017 and No. 597 of 26 August 2019
PZJ	quality assurance program
RA	radioactive
RAW	radioactive waste
RF	Russian Federation
RRRFR	Russian Research Reactor Fuel Return
SF	spent fuel
SFSF Dukovany	Spent Fuel Storage Facility (Dukovany)
SFSF Temelín	Spent Fuel Storage Facility (Temelín)
SÚJB	State Office for Nuclear Safety (or Office)
SÚJCHBO	State Institute for Nuclear, Chemical and Biological Protection
SÚRAO	Radioactive Waste Repositories Authority (or the Authority)
SÚRO	State Institute for Radiation Protection
SVO	special water purification system
TLD	thermoluminescent detector
ÚJF Řež	Nuclear Physics Institute Řež
URL	Underground Research Laboratory
ÚVVVR	Institute for Research, Production and Utilization of Radioisotopes, Prague
VVER	type identification of light water reactors designed in the former Soviet Union (water cooled water moderated power reactor)
WAC	Waste Acceptance Criteria

Summary

On 25 March 1999 the government of the Czech Republic approved the Joint Convention which came into effect in the Czech Republic on 18 June 2001. In agreement with the obligations resulting from its accession to the Joint Convention the Czech Republic has drawn already the seventh National Report for the purposes of review meetings of the contracting parties, which describes the system of spent fuel and radioactive waste management in the scope required by selected articles of the Joint Convention. At the same time the National Report contains information on implementation of the Directive which entered into the force on 22 August 2011. The content of the National Report takes into consideration requirements of articles of the Directive and contains a new chapter 6.7 (Transparency) to comply with of Article 10 of the Directive. In the course of preparation of the sixth and the consecutive National Reports the non-binding recommendations of ENSREG published in a guide for preparation of national reports as required under Article 14.1 of the Directive were taken into the consideration as well.

The Report fully reflects changes in the national legislation as in effect since 1 January 2017 in connection with the new Atomic Act No. 263/2016 Coll. and related implementing regulations. The other information contained in the report was gathered and updated as at 31 December 2019, unless stated otherwise. Meanwhile, at the national level the National Report serves as a source of up-to-date publicly available information (<http://www.suib.cz>) on methods of spent fuel and radioactive waste management in all facilities subject to the Joint Convention and on the method of implementation of requirements of the Directive.

Results of previous six review meetings of the Contracting Parties to the Joint Convention in 2003 till 2018 and the existing practices make it possible to conclude that spent fuel and radioactive waste in the Czech Republic is managed fully in compliance with the Joint Convention articles. The Atomic Act and its implementing decrees form a legislative base for all activities in spent fuel and radioactive waste management and clearly define responsibilities of licensees for the achieved level of nuclear safety, radiation protection, radiation extraordinary event management and physical protection. Specific activities were performed by the end of 2019 which ensured that:

- the long-term storage of spent fuel from all operated nuclear power plants at the territory of the Czech Republic complies with the adopted government Policy using type-approved casks placed in dry spent fuel storage facilities at NPP Dukovany and NPP Temelín sites,
- new conditioning technologies have been tested and used on both NPPs for operational sludge and ion exchangers so that the resulting radioactive waste form can be safely disposed in the disposal facility Dukovany
- safe storage and disposal of all categories of operating and institutional low- and intermediate-level waste continued in near-surface disposal facilities operated by the state organization SÚRAO, established by MPO to provide for activities associated with radioactive waste disposal
- remediation of old environmental liabilities on the ÚJV Řež, a. s. has been completed.

From activities to improve safety of radioactive waste management planned for years 2019-2020 it should be mentioned the gradual implementation of refurbishment of disposal facility Richard.

In the long-term perspective, the key activity foreseen in the area of spent fuel and radioactive waste management is the development of a national deep geologic repository which should be commissioned after 2065.

In conclusion, SÚJB, as the state administration body responsible for elaboration of this report, would like to express its thanks for the support provided in the process of National Report development by the following organizations engaged in spent fuel and radioactive waste management in the Czech Republic: ČEZ, a. s., Centrum výzkumu Řež s. r. o., ÚJV Řež, a. s. and SÚRAO.

1. Introduction

The present National Report is submitted by the Czech Republic for the purpose of the seventh Review Meeting of the Contracting Parties to the Joint Convention and the second report to the European Commission in implementation of the Directive. The objective is to describe the performance of obligations under the Joint Convention in the Czech Republic as of December 31, 2019. The National Report outline is based on the revised recommendations approved at the Second Review Meeting of the Contracting Parties to the Joint Convention held in May 2006 and provided in the "Guidelines Regarding the Form and Structure of National Reports (INFCIRC/604/Rev. 1)" of July 19, 2006 and on the non-binding "ENSREG Guidelines regarding Member States Reports as required under Article 14.1 of 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" of February 27, 2013.

By the mentioned date several facilities that are subject to the Joint Convention, were in operation in the Czech Republic. In addition to power generating units with four reactors of VVER 440/213 type, the site of NPP Dukovany, owned by ČEZ, a. s., also includes following nuclear installations:

- ISFSF Dukovany - in operation since 1997,
- SFSF Dukovany - in operation since April 2008 and
- RAW disposal facility Dukovany - in operation since 1995, owned by the state since 2000.



Fig. 1.1 Locations of selected nuclear installations and facilities subject to the Joint Convention in the Czech Republic

In addition to the mentioned standalone nuclear installations, the NPP Dukovany site also includes SF pools and transfer cask shafts used to handle SF in each production unit.

Similar facilities are also a part of NPP Temelín where two reactor units VVER 1000/320 are installed. The NPP Temelín site also includes SFSF Temelín which is in operation since December 2011.

SF generated by the operation of the research reactor LVR-15 in CV Řež s. r. o. may be stored in the HAW Storage Facility in ÚJV Řež, a. s., which is classified as a standalone nuclear installation in agreement with the Czech law. The other research reactors in CV Řež s. r. o. (LR-0) and FJFI ČVUT Prague (VR-1) do not produce any SF, due to their small thermal output and limited time of operation.

RAW of institutional origin is generated in the Czech Republic by the use of radionuclides in medicine, industry and research. Producers of RAW give it for further treatment and processing to licensees holding authorizations for RAW management. The licensees are ÚJV Řež, a. s., UJP Praha a. s., Zam-servis s. r. o., ISOTREND s. r.o. and VF a. s. In addition to RAW disposal facility Dukovany used for disposal of RAW from operation of nuclear power plants and selected categories of institutional RAW, there are the following disposal systems on the territory of the Czech Republic used for disposal of institutional RAW:

- RAW disposal facility Hostim in Beroun (active in the period of 1959-1964; closed in 1997),
- RAW disposal facility Richard in Litoměřice (institutional waste; in operation since 1964),
- RAW disposal facility Bratrství in Jáchymov (disposal of RAW contaminated by natural radionuclides; in operation since 1974).

In compliance with Article 12 of the revised document "Guidelines Regarding the Form and Structure of National Reports (INFCIRC/604/Rev. 1)" of July 19, 2006, the Table 1.2 provides a summary of methods of SF management and management of individual RAW categories in the Czech Republic which comply with the national policy and strategy defined in the Policy.

Differences in requirements of the Joint Convention and the Directive relating e.g. to reprocessing of SF, management of SF and RAW from military applications, management of RAW containing NORM, etc., are not relevant under the conditions of the Czech Republic. Since the remaining requirements of the Joint Convention and the Directive are almost identical and in order to effectively use available resources and to minimize the administrative burden, the Czech Republic has decided to prepare one National Report containing evidence that requirements of both the above mentioned documents have been met. Therefore this report is officially delivered to both Secretariats, of the Joint Convention and of EC.

Tab. 1.1. Proof of implementation of Directive's articles in the National Report

Article of the Directive	Article of National Report	No. of pages	Article of the Directive	Article of National Report	No. of pages	Article of the Directive	Article of National Report	No. of pages
4.1	2.2	3	5.1 h)	6.2	3	9	6.2	see 5.1 h)
4.2, 4.4	9	3	5.2	2.2	viz. 4.1	10.1-10.2	6.7	see 5.1 g)
4.3	2.2	see 4.1	6.1- 6.3	5.3	11,5	11.1-11.2	2.2	see 4.1
5.1 a)	2.2	see 4.1	7.1	6.1	see 5.1 f)	12.1	12.4-12.5	2,5
5.1 b)	5.2.1	1,5	7.2-7.3	7.5, 8.5	8	12.2	2.2	see 4.1
5.1 c) - e)	5.2.2	2	7.4	6.3	7,5	Total		about 45
5.1 f)	6.1	1,5	7.5	6.2				
5.1 g)	6.7	1,5	8	6.2				

Tab. 1.2 Overview of SF management and management of individual categories of RAW

Type of liability	Long term management policy	Funding	Current practice/facilities	Planned facilities
Spent fuel	Preferred alternative - direct disposal in DGR but other options are not excluded (reprocessing, regional disposal facility)	Nuclear account	Long-term storage / ISFSF and SFSF Dukovany, SFSF Temelín (SF from NPP) + reprocessing in Russian Federation and storage / HAW Storage Facility (SF from research reactors)	DGR
Nuclear fuel cycle waste	Disposal in operating disposal facilities and in planned DGR	Nuclear account	Disposal in the operating disposal facility (Dukovany) and storage in operational systems (NPPs)	DGR
Institutional waste	Disposal in operating disposal facilities and in planned DGR	Nuclear account	Storage and disposal in operating disposal facilities (Richard, Bratrství, Dukovany) and storage (ÚJV Řež, a. s.)	DGR
Decommissioning liabilities	Deferred decommissioning (NPP) and immediate decommissioning (research reactors and other NIs), RAW will be disposed in Dukovany disposal facility	Decommissioning fund	Periodical review of decommissioning plans; all nuclear installations (NPPs, research reactors, SF storage facilities) are currently in operation	DGR
Used sealed sources	Disposal in operating disposal facilities and in planned DGR; return to the country of origin	Licensee; if the licensee is not known then the state budget	Storage and disposal in operating disposal facilities	DGR
Mining and milling waste	Tailing pond rehabilitation	State budget (state enterprise)	Recovery of chemical uranium production on the Stráž site and use of tailing ponds on the Rožná site (Dolní Rožínka)	None

2. RAW categories and RAW and SF management Policy – Art. 32, par. 1 of the Joint Convention

1. *In accordance with the provisions of Article 30, each Contracting Party shall submit a national report at each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:*
 - (i) *spent fuel management policy,*
 - (ii) *spent fuel management practices,*
 - (iii) *radioactive waste management policy,*
 - (iv) *radioactive waste management practices,*
 - (v) *criteria used to define and categorize radioactive waste.*

2.1. Radioactive Waste Categories

In agreement with the Atomic Act, radioactive waste is defined as “*substances, objects or equipment containing or contaminated by radionuclides for which no further use is foreseen and do not meet conditions established hereunder for clearance of radioactive substances from the workplace*”.

In agreement with the Decree No. 377/2016 Coll., on requirements for safe management of radioactive waste and decommissioning of nuclear installations or workplaces of category III or IV, RAW is further categorised as gaseous, liquid and solid. Solid RAW is classified, particularly based on the method of disposal as follows:

- a) temporary radioactive waste, which after storage for at most 5 years exceeds radioactivity lower than clearance levels;
- b) very low-level waste with radioactivity higher than that of temporary radioactive waste, but which does not require any special measures during disposal;
- c) low-level waste with radioactivity higher than that of temporary radioactive waste, but which at the same time contains limited amounts of long-lived radionuclides;
- d) intermediate-level waste that contains a significant amount of long-lived radionuclides, and therefore it requires a higher degree of isolation from the surrounding environment than the low-level waste; and
- e) high-level waste for which, during storage and disposal, it is necessary to take into account heat generated by decay of the contained radionuclides; the waste is processed and treated to meet the acceptance criteria and it must be disposed in deep geological repositories several hundred meters under the ground.

SF shall not be considered radioactive waste under the Atomic Act unless it has been declared as RAW by its owner or by SÚJB. SF storage shall be subject to the same requirements as RAW management before disposal and SF shall be stored so that its further treatment is not impeded.

Natural materials produced in the course of mining and treatment of uranium ores are managed subject to the Act No. 157/2009 Coll., on mining waste management, Act No. 263/2016 Coll., Atomic Act, as sources of ionizing radiation and therefore they are not covered by this report. Such natural facilities are gathered in waste dumps and mud pits which are supervised by SÚJB, due to the present radioactive substances to ensure radiation protection of workers and

population. Disposal facilities containing solely natural radionuclides are not considered nuclear installations under the Atomic Act.

2.2. Radioactive Waste Management and Spent Fuel Management Policy

Article 12 of the Directive:

2. *The national programme together with the national policy may be contained in a single document or in a number of documents.*

The Policy (i.e. national policy and practice according to the Joint Convention terminology and national policy and national programme according to the Directive terminology) adopted by the Czech Government on May 15, 2002 (Government Resolution No. 487/2002) is a fundamental document which defines the RAW management policy and strategy of the government and its agencies (waste generated from nuclear installations and workplaces with ionizing radiation sources in healthcare, research and industry). The Policy has been updated in 2010-2014 to comply with the current RAW management practices, the status of DGR development, changes in legal framework, governmental documents and international experience and trends. Another reason for the update of the Policy were the requirements of the Directive and recommendations of IAEA and OECD/NEA. The draft of updated Policy has been approved by the Government on 15 December 2014. Then the updated Policy, once passed through the Strategic Environmental Assessment process, was approved by Government Resolution No. 852/2017 of 29 April 2017. As a consequence of the EC requirement to complement so-called 'key performance indicators' in the implementation of the Policy and to provide cost assessment of the national programme, a further update of the Policy had been carried out in 2019 and the document currently in force was discussed and then approved by the Government by Resolution No. 597/2019 of 26 August 2019.

Article 4 of the Directive:

1. *Member States shall establish and maintain national policies on spent fuel and radioactive waste management. Without prejudice to Article 2(3), each Member State shall have ultimate responsibility for management of the spent fuel and radioactive waste generated in it.*
3. *National policies shall be based on all of the following principles:*
 - (a) *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;*
 - (b) *the interdependencies between all steps in spent fuel and radioactive waste generation and management shall be taken into account;*
 - (c) *spent fuel and radioactive waste shall be safely managed, including in the long term with passive safety features;*
 - (d) *implementation of measures shall follow a graded approach;*
 - (e) *the costs for the management of spent fuel and radioactive waste shall be borne by those who generated those materials;*
 - (f) *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.*

The following is crucial for RAW and SF management:

- adherence to a legal framework which does not permit any developments in RAW and SF

management which would be inconsistent with the requirements for the protection of people and the environment,

- guaranteed compliance with and enforceability of legal regulations,
- clear specification of the basic responsibilities of all legal entities and persons involved in RAW or SF management,
- comprehensive coverage of all activities that might give rise to RAW or SF and the maintaining of records such materials.

Such a system has already been created to a large extent in the Czech Republic and will be further developed in compliance with the basic principles of RAW management as defined by the IAEA and with the requirements of the Joint Convention. In addition, other principles of the Policy do comply with the requirements of the Atomic Act and its decrees on responsibility for the safety of RAW and SF management, minimization of RAW generation, interdependencies in RAW management, funding of RAW management etc.

Other principles of the Policy are:

- Only relevant licensees are eligible to manage RAW and SF; licences are issued by the SÚJB provided that requirements specified in the Atomic Act and related implementing regulations have been met.
- RAW and SF management in the Czech Republic must be conducted in compliance with national strategic aims and internationally recognised principles (IAEA and OECD/NEA recommendations and EC requirements).
- All the costs of RAW and SF management are borne by the respective RAW and SF producers. The cost of the disposal of RAW and SF produced at the present time will be not a burden to future generations.
- RAW and SF producers are obliged to restrict RAW generation to a minimum level, provide SÚRAO with data on short-term and long-term RAW and SF 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 SF and/or RAW which is unacceptable for disposal in near-surface disposal facilities are calculated separately.
- RAW and SF management licensees are further obliged to maintain records of RAW and SF which document all the RAW and SF characteristics required by legislation.
- RAW is treated prior to disposal by the relevant SÚJB licensees, 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 disposal facilities 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 SF 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, SF and RAW unacceptable for disposal in near-surface disposal facilities will be stored by producers or at facilities managed by SÚRAO.
- RAW and SF 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 SF and its radiotoxicity will be monitored and assessed on an ongoing basis.

- The public will be fully involved in the RAW and SF geological disposal facility 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.

Article 5 of the Directive:

1. Member States shall establish and maintain a national legislative, regulatory and organizational framework ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:

- (a) a national programme for the implementation of spent fuel and radioactive waste management policy;

Article 11 of the Directive:

1. Each Member State shall ensure the implementation of its national programme for the management of spent fuel and radioactive waste ('national programme'), covering all types of spent fuel and radioactive waste under its jurisdiction and all stages of spent fuel and radioactive waste management from generation to disposal.
2. Each Member State shall regularly review and update its national programme, taking into account technical and scientific progress as appropriate as well as recommendations, lessons learned and good practices from peer reviews.

The fundamental legal regulations governing the licensing and approval process for nuclear installations and workplaces of category IV, or for workplaces with sources of ionizing radiation, are the Act No. 183/2006 Coll., on town and country planning and building code (Building Act) and the Atomic Act. The Act No. 500/2004 Coll., Code of Administrative Procedure, Act No. 100/2001 Coll., on environmental impact assessment and amendments to some related acts, and the Act No. 106/1999 Coll., on free access to information, are other important parts of the legislative framework in this area. The acts are further linked to regulations of lower legal force (see more details in chap. 5).

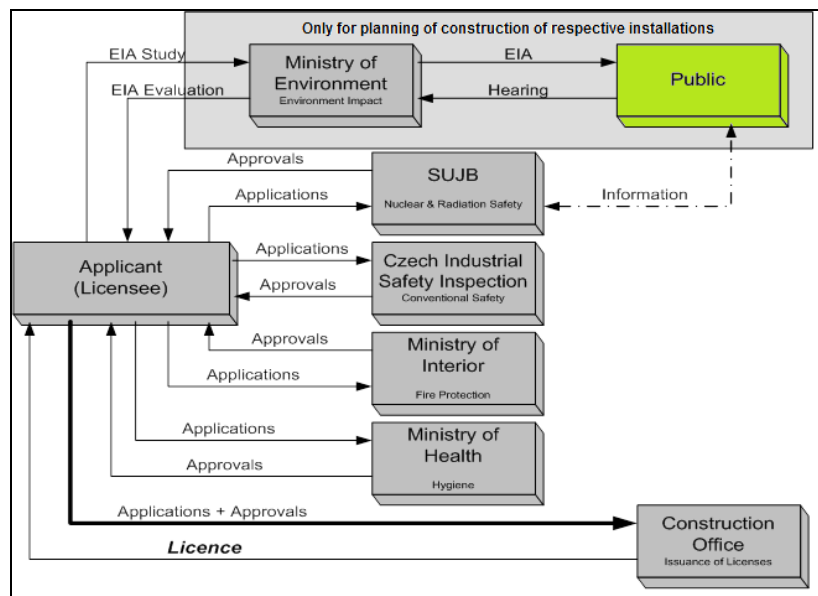


Fig. 2.1 Diagram of licensing and approval processes for nuclear installations and for workplaces of category IV

From the viewpoint of the Building Act, the issuance of three fundamental approvals for any nuclear installations and workplaces of category IV, i.e. building permit, final inspection approval (for operation) and permit for removal of a structure, is in the competence of the Ministry of Industry and Trade which is the competent building office for such resolutions. In respect to the land use permit, the competent building office is the Ministry of Regional Development of the Czech Republic.

The Atomic Act specifies activities for which SÚJB authorisation is required. Apart from the main licenses concerning siting, construction, operation, decommissioning (or closing of a disposal facility), licenses are required for the first physical start-up of a nuclear installation with a nuclear reactor, the first power start-up of a nuclear installation with a nuclear reactor, commissioning of a nuclear installation without a nuclear reactor, for a change with an impact on nuclear safety, technical safety and physical protection of a nuclear installation, for a change with an impact on radiation protection and radiation extraordinary event management at workplaces of category IV, **clearance of radioactive substance from the workplace** etc.

2.2.1. Management of low- and intermediate-level waste

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 disposal facility.

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 cleared after their radiochemical control.

Technical solution for RAW collection, sorting, processing, conditioning and storage at NPPs are addressed in Chapters 4.2.1 and 4.2.2 and for disposal in Chapter 4.2.3. Details on the funding of RAW management at NPPs are covered by Chapter 6.2.

Assurance of safe management of institutional RAW, i.e. RAW from utilization of ionizing radiation in the industry, health services or research, is much more complicated, particularly due to the high number of generators and diversity of generated institutional RAW. Throughout the territory of the Czech Republic there are 140 generators of RAW. A vast majority of institutional RAW is low-level waste that can be disposed in near-surface disposal facilities. An only small part of ILW and HLW 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, a. s. Institutional RAW is disposed of at the Richard and Bratrství disposal facilities and limited amount at the Dukovany disposal facility (see Chapter 4.2.3). Details on the funding of institutional RAW are presented in Chapter 6.2.

More details about management of low- and intermediate-level RAW is provided in the Czech Republic National Report under the Joint Convention, Revision 5.1 of April 2015.

2.2.2. Management of SF and RAW not acceptable for near-surface disposal facilities

The fundamental strategy of the Czech Republic for SF disposal is its direct placement in a deep geological repository which will be ready for operation by 2065. Up to the time of the deep geological repository commissioning, SF and RAW not acceptable for disposal in near-surface disposal facilities would be safely stored at the producers sites. The safety of the future deep geological repository must be proved prior to construction by means of the conducting long-term experiments in an underground laboratory.

More details about management of SF and RAW not acceptable for near-surface disposal facilities are provided in the Czech Republic National Report under the Joint Convention, Revision 5.1 of April 2015.

Article 5 of the Directive:

2. Member States shall ensure that the national framework is improved where appropriate, taking into account operating experience, insights gained from the decision-making process referred to in Article 4(3)(f), and the development of relevant technology and research

In connection with the planned development of new nuclear sources, expected extension of operation of the existing NPPs, necessity to ensure sufficient disposal capacity for institutional RAW and requirements of the Directive, SÚJB in cooperation with MPO and SÚRAO, initiated a process of review and updating of the Policy. The objectives of the updated Policy are particularly the following:

- to identify and to specify strategically substantiated, scientifically, technologically, environmentally, financially and socially acceptable principles and objectives for RAW and SF management in the Czech Republic;
- to maintain an up-to-date system framework for decision-making of agencies and organizations responsible for RAW and SF management in the Czech Republic;
- to understandably communicate information about the long-term solutions for management of RAW and SF to all affected entities and general public and, at the same time, to make it possible for the affected public to effectively participate in fulfillment of the Policy objectives;
- to create a framework for progress evaluation in management of RAW and SF and for communication of applicable reports under the Joint Convention and the Directive.

The draft of updated Policy respects the requirements of Article 4.3 of the Directive reflects experiences gained during the operation of existing disposal facilities and considers results of R&D projects defined by previous Policy from 2002 and evaluated in Chapter 12.2 of the draft of updated Policy. One of the tasks defined in original Policy was the harmonization of national legal framework (Atomic Act and related decrees) with EU legislation. This process had lasted several year and was completed during the year 2017. New atomic act fixed some legal and technical issues and implemented current recommendations of international organisations (IAEA, OECD) and EU legal documents related to the use of nuclear energy.

3. Scope of Application – Article 3 of the Joint Convention

- 1. This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.*
- 2. This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.*
- 3. This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defense programs, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defense programs if and when such materials are transferred permanently to and managed within exclusively civilian programs.*
- 4. This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.*

The draft of updated Policy still does not anticipate reprocessing of SF produced by operation of power generating reactors in the Czech Republic, **even if considered as an option**. The use of SF reprocessing technologies is justified as long as it's economic or safety benefits have been proved. The existing prices in the fuel cycle front end, in particular prices of natural uranium, currently make SF reprocessing economically unattractive. From the viewpoint of safety, reprocessing does not significantly increase radiation hazards but, in terms of disposal, reprocessing or RAW treatment procedures enable separation of long-term and hazardous radionuclides and thus their optimum treatment before disposal. On the other hand, the DGR design requirements for disposal of HLW from SF reprocessing are more challenging than for direct disposal of SF.

The presented National Report provides a comprehensive evaluation of the management practices used for all RAW categories covered by the Joint Convention, i.e. both operating and institutional RAW management.

In accordance with the Atomic Act, nuclear energy may be only used for peaceful purposes in the Czech Republic and therefore our country does not participate in any military oriented projects of nuclear energy utilization. For this reason SF and RAW in the Czech territory solely originate from peaceful utilization of nuclear energy.

The information on discharges is provided in the respective chapters referring to Articles 4, 7, 11, 14, 24 and 26 of the Joint Convention.

4. Inventory and List of Facilities for SF and RAW Management – Article 32, par. 2 of the Joint Convention

2. *This report shall also include:*
- (i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;*
 - (ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;*
 - (iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;*
 - (iv) an inventory of radioactive waste that is subject to this Convention that is being held in storage at radioactive waste management and nuclear fuel cycle facilities; has been disposed of; or has resulted from past practices. This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;*
 - (v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.*

4.1. Inventory and Facilities for SF management

This part of the National Report contains a list and brief description of facilities used for SF management in nuclear power and research facilities. In addition to the information given in Chapter 7, this Chapter 4 provides details concerning the following SF management facilities:

- for NPP Dukovany site - SF pools, ISFSF and SFSF Dukovany,
- for NPP Temelín site - SF pools and SFSF Temelín,
- for CV Řež - SF pool and SF storage facility,
- for ÚJV Řež, a. s. site - HAW Storage Facility.

4.1.1. Nuclear Power Plant Dukovany

The basic description of NPP Dukovany units, including technical specifications, is provided in the National Report submitted of the Czech Republic under the Convention on Nuclear Safety of September 2001.

4.1.1.1. SF Pools

To ensure safe storage of SF removed from reactors, a SF pool is constructed next to each reactor unit, its volume being 335 m³, where SF is stored for a period of time necessary to reduce the residual heat output. After that SF assembly thermal output and radiation drops to a level permitting their transport in CASTOR-440/84, CASTOR-440/84M or ŠKODA 440/84 type-approved casks for transportation and storage to ISFSF or SFSF Dukovany. The storage pools for SF provide the following functions:

- subcriticality of stored SF,

- residual heat removal from FAs,
- radiation protection.

In the pools, SF is stored in a compact rack with the capacity of 682 positions. SF pool also contains 17 positions for hermetically sealed containers for damaged SF storage. Damaged SF will be managed during the decommissioning of the NPP. Depending on the number of removed FAs in the annual reactor cycle, the pools enable to store SF for a period of at least 7 years. In the case of emergency fuel removal from the core or during a reactor pressure vessel inspection, however, a reserve rack is inserted into the SF pool.



Fig. 4.1 SF pool and transfer cask shaft during reactor refueling

As at December 31, 2019 the four SF pools contained 2306 FAs with the total weight of heavy metals about 273 177 kg. There are 5 FAs declared as damaged (1 mechanically, 4 leaky) in SF pools.

4.1.1.2. ISFSF Dukovany

ISFSF Dukovany, located on the NPP site, is designed for dry storage of SF using CASTOR- 440/84 casks. The central building of ISFSF Dukovany is a ground-level hall with a combined structural system consisting of fixed reinforced concrete poles and steel roof structure with a 6-meter module. The poles bear a crane runway and roof steel open-web girders supporting the roof structure. The storage part with marked positions for the individual casks, including the receiving section, is provided with a traveling crane with the lifting capacity 130/5 t. The building shell is assembled from reinforced concrete panels of thickness 100 mm. The storage area of the building is surrounded with a shielding concrete wall 5 m high and 500 mm thick. The floor is made of a reinforced concrete slab with dust-free consolidating surface finish.

ISFSF Dukovany forms an independently operating facility linked to existing engineering utility networks in NPP Dukovany. It has a railway siding and road links through SFSF Dukovany to the reactor units of NPP Dukovany.

The total capacity of ISFSF Dukovany is 60 casks, while the last 60th CASTOR-440/84 cask was placed in ISFSF Dukovany on March 8, 2006. Consequently, ISFSF Dukovany contained 60 casks CASTOR-440/84 with the total number of 5040 fuel assemblies as at December 31, 2019.

4.1.1.3. SFSF Dukovany

SFSF Dukovany, located on the NPP site and connected with ISFSF Dukovany, is used for dry storage of SF using CASTOR-440/84M and ŠKODA 440/84 casks. The storage capacity of SFSF Dukovany is sufficient to cover all SF production of NPP Dukovany, after the existing storage capacity of ISFSF Dukovany is exhausted, with the anticipated operation of the units at least until 2030.



Fig. 4.2 Storage hall in SFSF Dukovany

SFSF Dukovany is a facility independent of ISFSF Dukovany. The building comprises a rectangular hall of the length 107.9 m divided into two main parts, specifically the receiving area and storage hall. In the receiving area, casks are mainly received into the storage or loaded for transportation. The railway siding enters the SFSF receiving area which is linked to the existing ISFSF Dukovany through a connecting corridor.

The storage part with marked positions for the individual casks, including the receiving section, is provided with a traveling crane with the lifting capacity 130/10 t. The outside shielding wall from reinforced concrete around the storage part of SFSF Dukovany is 4.8 m high, 0.5 m thick.

The storage capacity of SFSF Dukovany is 1340 t of heavy metal in 133 casks. As at December 31, 2019 SFSF Dukovany contained 43 CASTOR-440/84M casks with the total number of 3612 FAs.

4.1.2. Nuclear Power Plant Temelín

The basic description of NPP Temelín units, including technical specifications of the plant, is provided in the National Report of the Czech Republic under the Convention on Nuclear Safety of September 2001.

4.1.2.1. SF Pools

Similarly to NPP Dukovany, the main production building of NPP Temelín provides a storage pool with the volume of 1440 m³ for SF removed from the reactor, immediately next to the reactor

cavity. The removed SF is stored in the storage pool for a period up to 12 years (during NPP operation), or for at least 5 years (after NPP decommissioning).

The SF pool consists of 3 parts: two larger parts contain two rack sections each and the third has only one storage rack section. The entire SF pool enables to store 678 fuel assemblies, 25 fuel assemblies in hermetically sealed containers (10 positions occupied) and 2 cluster cases (one position occupied). In the normal storage mode, however, at least 163 positions shall remain unoccupied for emergency removal of fuel from the whole core. In the future, in the period of operation of the NPP Temelín, the leaky FAs (at the end of 2019 88 pcs) will be gradually taken out of SF pools and after type approval of relevant casks will be loaded into them and then transported and stored in SFSF Temelín.

As at December 31, 2019 the SF pool at unit 1 of NPP Temelín contained 432 FAs and 25 stand-alone fuel rods and the SF pool at unit 2 contained 404 FAs and 24 stand-alone fuel rods with the total weight app. 379 309 kg of heavy metal.



Fig. 4.3 Uncovered SF pool at NPP Temelín

4.1.2.2. SFSF Temelín

The Spent Fuel Storage Facility Temelín, located directly on the NPP Temelín site is used for dry storage of spent fuel using CASTOR-1000/19, ŠKODA 1000/19 and ŠKODA 1000/19M casks. The storage capacity of SFSF Temelín is sufficient to cover all SF production of two NPP Temelín units for 30 years of its operation and it may be expanded on as needed basis by building of additional storage halls.

SFSF Temelín is an independent object divided into two main parts, specifically the receiving area and storage hall. The casks are delivered to the receiving area of the storage facility by a railway siding and loaded to be transported. The receiving area also includes three service places, additional premises for maintenance and repairs, building technology premises and sanitary facilities for the operating personnel.

The storage part of the object has been designed as a one-story two-aisle hall object with lengthwise cranes that reach under the crane in the receiving part. The central partition wall dividing the hall into two aisles is interconnected with supporting columns for the crane track.



Fig. 4.4 Storage hall in SFSF Temelín

The storage capacity of SFSF Temelín is 1370 t of heavy metals in 152 casks. As at December 31, 2019 SFSF Temelín contained 42 CASTOR-1000/19 cask with 798 FAs and one ŠKODA 1000/19 cask with 19 FAs.

4.1.3. Centrum výzkumu Řež s. r. o.

In 2010 both research reactors in the complex of ÚJV Řež, a. s. were transferred into the company Centrum výzkumu Řež s. r. o. The limited liability company CV Řež was founded on October 9, 2002 as a subsidiary of ÚJV Řež, a. s. for the purposes of research and development and natural and technical sciences. The core activity of CV Řež is the provision of experimental base for research and development on the reactors LR-0 and LVR-15.

The basic description of LVR-15 research reactor, including the technical specifications, is provided in the National Report of the Czech Republic under the Joint Convention, Revision 1.1 of February 2003.

4.1.3.1. SF Pool in the Reactor Hall

The wet accumulator tank is designed for storage of SF removed from LVR-15 reactor core. It is an aluminum vessel seated in the floor of the reactor hall and protected on all sides with concrete and a steel-plated case. The vessel is covered with three cast iron plates 500 mm thick. The plates have two handling openings sealed with blinds. A sloping pipe ending at the tank bottom provides connection between the upper edge of the reactor vessel and the tank. The condition of the tank and the level and physicochemical parameters of water inside the tank are continuously monitored.

As at December 31, 2019 the tank contained 73 FAs of IRT-4M type with the initial enrichment of 19.7% wt. ²³⁵U.

4.1.3.2. Building 211/7 - SF Storage Facility

The building accommodates two pools - A and B. The inner dimensions of the pool A are 230 x 120 cm, depth 6 m and the inner dimensions of the pool B are 440 x 120 cm, depth 6 m. The

lengths are stated including a 50 cm long handling recess. The pools are constructed with heavy concrete cast between the inner and outer jacket of a stainless steel vessel. The pool bottom and walls consist of a stainless steel inner jacket, 50 cm of heavy concrete and an outer stainless steel jacket. For a detailed description of Building 211/7 - SF storage facility, see the National Report of the Czech Republic under the Joint Convention, Revision 2.3 of September 2005.

As at December 31, 2019 there were 73 fuel assemblies of IRT-4M type stored in the SF storage facility. All SF with the initial enrichment higher than 20% wt. ^{235}U , i.e. 112 fuel assemblies of IRT-2M type with the initial enrichment of 36% wt. ^{235}U , had been transported to the Russian Federation for reprocessing in March 2013.

4.1.4. ÚJV Řež, a. s. (Building 211/8 - HAW Storage Facility)

The HAW Storage Facility is designed for storage of SF and solid RAW produced in ÚJV Řež, a. s. and in CV Řež. The facility was built in 1981 – 1988. Its trial operation started in 1995 and the facility has been in commercial operation since 1997. The structural details of the original HAW Storage Facility are provided in the National Report of the Czech Republic under the Joint Convention, Revision 2.3 of September 2005.

As part of rehabilitation efforts to remove the old environmental liabilities and in the scope of the preparation for transport of high-enriched SF to the Russian Federation for reprocessing (RRRFR project is a part of the GTRI initiative declared on May 26, 2004), the HAW Storage Facility underwent an extensive reconstruction, completed in two stages within 2003 - 2007. Stage 1 included construction of a hot chamber, control room and storage installation (safe) in Boxes VI, VII and VIII of the HAW Storage Facility. Stage 2 of the refurbishment of the HAW Storage Facility included construction of a storage extension to the HAW Storage Facility for storage of Škoda VPVR/M casks, with SF type EK-10 and IRT-2M and preparation of workplaces for loading of Škoda VPVR/M casks and for management of damaged SF.

No spent fuel was stored in the HAW Storage Facility as at December 31, 2019.

4.2. Inventory and Facilities for RAW Management

4.2.1. Nuclear Power Plant Dukovany

The operation of NPP Dukovany generates liquid, solid and gaseous RAW. Facilities for RAW management are listed according to the individual types of RAW in the chapters below.

4.2.1.1. Solid RAW

4.2.1.1.1. Facilities for management of solid RAW

- **Low-level solid RAW**

The management of low-level solid waste consists of the following steps:

- controlled collection and primary segregation of solid RAW by the type is performed at stable assigned places (at least 60 stable collection points in HVB, and additional may be established on as needed basis, particularly during regular and general repairs of the units). The collection points are provided with PE bags and metal bins for minor metal waste. Solid RAW with dose equivalent rate $> 1\text{mSv/h}$ are collected in shielded boxes. The collected waste is transported from collection points to BAPP,

- measuring and segregation of solid RAW - primary measuring and segregation of solid RAW based on their radioactivity and waste type is performed in BAPP. The measurement uses hand-held devices, measuring carousel and sorting table,
 - clearance of solid waste into the environment - a part of solid waste suitable for clearance is officially measured to determine the content of radionuclides. The waste meeting criteria of the Act No. 263/2016 Coll. and Decree No. 422/2016 Coll. is cleared from a workplace or disposed of on the dump for solid municipal waste in Petrůvky, if not dismissed by SÚJB and complying with the criterion that "the effective dose of each member of the public during a calendar year caused by a discharge is lower than 0,01 mSv",
 - storage of solid RAW –solid waste which cannot be cleared from a workplace is classified as solid RAW and stored in an organized manner in box pallets with the volume 0.4 m³ and 0.8 m³ or, after low-pressure compacting (15 t), in 200-liter galvanized casks in BAPP storage vaults,
 - the part of the solid RAW intended for decay storage or for reuse in an incinerating plant is kept loose in the storage premises in PE bags.
- Intermediate-level solid waste (waste failing to meet the waste acceptance criteria for disposal in RAW disposal facility, non-generating heat)

If RAW cannot be disposed in a RAW disposal facility due to its high specific activity of radionuclides it is stored in an organized manner in a storage area for radioactive items while their final treatment and disposal will be addressed within the NPP decommissioning process.

4.2.1.1.2. Facilities for processing of solid RAW

- Low-level solid RAW

The part of solid waste that cannot be cleared from a workplace is processed or treated (incineration, high-pressure compacting, remelting) in external technological facilities and deposited in radioactive waste disposal facilities. Non-treated solid radioactive waste is stored in the storage facility for solid RAW.
- Intermediate-level solid RAW

Intermediate-level waste is not treated but only fragmented (if practicable) and stored under controlled conditions in the storage facility for radioactive waste.

4.2.1.1.3. Facilities for storage of solid RAW

- Low-level solid RAW

The low-level solid RAW storage system is located in BAPP. It consists of 13 concrete rooms (storage wells) sized 6 x 9 x 11 m. The room floors are built at the elevation - 1.3 m. The rooms are covered with in-situ concrete blocks 600 x 96 x 30 cm (weight 4.4 t), or closed with hermetic closures (in three layers) sized 170 x 170 cm at the elevation +10.80 m. A steel hall 9 x 60 x 8 m is constructed above the storage area at the elevation +10.80 m to shelter the whole area above the rooms. In the hall, an overhead 5 t crane is used to handle monolithic panels, hermetic closures and to load box pallets with solid RAW in the rooms. For the time being, the following 8 rooms are used of the total number of 13 rooms:

 - 4 rooms in BAPP 108/2, 3, 4, 5 are equipped with built-in structures for palletization. The rooms are used for solid RAW storage using box pallets, or 200 l drums. Each room is

covered with 8 monolithic panels. The structure inside divides each room into 32 units (unit dimensions: 1206 x 860 mm). Each unit accommodates up to 20 stacked folding- up pallets,

- 1 room is intended for storage of spent air-conditioning filters. The room is divided into 48 units, each with a built-in steel structure 600 x 600 mm. Each unit is covered with a hermetic closure, and
- 3 rooms are used for storage reserve of solid non-standard RAW that is difficult to process into box pallet dimensions. Each room has 6 openings covered with hermetic closures.

- **Intermediate-level solid RAW**

Intermediate-level solid RAW is kept in the storage facility for active items in the reactor hall (in the so-called "mogilnik") A, B 314 and on the floor ± 0.0 m A, B 101/1,2. The anticipated storage time is until NPP decommissioning.

4.2.1.2. Liquid RAW

4.2.1.2.1. Facilities for management of liquid RAW

Liquid RAW generated in the process of radioactive liquid treatment and processing are collected and placed in BAPP storage tanks with the volume of 460 or 550 m³.

The bituminization technology is used for radioactive concentrate conditioning into a form acceptable for RAW disposal facility Dukovany. The bitumen-based product is then disposed in RAW disposal facility Dukovany using 200-liter galvanized drums.

In 2017 radioactive concentrate from tanks 7TW10B05 and 7TW10B04 was processed. Further radioactive sediment was removed from storage tank 7TW10B05 and the tank was cleaned. Separated solid fraction weighing 29 t was conditioned in aluminosilicate matrix to produce 208 drums with the overall weight of 61 t to be disposed.

In 2018 radioactive concentrate from tanks 7TW10B04 and 7TW10B06 was processed. Further radioactive sediment was removed from storage tanks 7TW10B03 and 7TW10B04 and then these tanks were cleaned. Separated solid fraction weighing 72 t was conditioned in aluminosilicate ALUSIL[®] matrix to produce 369 pcs of 200-liter MEVA drums.

In 2019 radioactive concentrate from tank 7TW10B06 was processed. Radioactive sediment was removed from storage tank 7TW10B04 and the tank was cleaned. Separated solid fraction weighing 91 t was conditioned in aluminosilicate ALUSIL[®] matrix generating 73 t of RAW in 494 pcs of 200-liter MEVA drums. Conditioning of remaining 18 t will be finished in 2020.

4.2.1.2.2. Facilities for storage of liquid RAW

The system for storage of liquid RAW consists of:

- storage tanks for radioactive concentrate with the total volume 2110 m³ (3x550 m³ + 460 m³) per double reactor unit,
- two backup tanks with the volume of 550 m³,
- two tanks for active sorbents with the volume of 460 m³ each,
- pumps and auxiliary technology equipment.

Liquid RAW of the organic origin (oils) are stored in 200 l metallic drums. There are safety sumps under them to accommodate the whole volume of the stored drums.



Fig. 4.5 View of a bituminization line to process liquid RAW

Tab. 4.1 Comparison of the actually stored RAW with the operational limits and conditions for storage as at December 31, 2019

Waste type	Maximum Allowable Stored	Actually Stored Amount
Liquid RAW - Active Water Concentrates	3300 m ³	804 m ³
Liquid RAW - Used Sorbents	300 m ³	83 m ³
Solid RAW Total	800 t	261 t (incl. 16 t from NPP Temelín)

4.2.1.3. Gaseous RAW

4.2.1.3.1. Facilities for collection of gaseous RAW

Gaseous RAW is removed using venting technology systems (piping, tanks) and ventilation systems (premises).

4.2.1.3.2. Facilities for processing of gaseous RAW

Gaseous RAW is processed in the venting process systems - gaseous RAW is either treated or held-up. The treatment includes filtration of radioactive aerosols, including radioactive iodine in the aerosol form. Hold-up means that gas flow is decelerated which causes the activity of short-term radionuclides to drop. Processing of gaseous RAW produces solid RAW and gas that complies with the requirements for clearance of radioactive substances from a workplace.

Tab. 4.2. Activities of gaseous and liquid discharges

Radionuclide	Discharges into the atmosphere A [Bq]		
	Year		
	2017	2018	2019
Noble gases	3.43x10 ¹²	3.05x10 ¹²	2.30x10 ¹²
Aerosols	2.31x10 ⁷	1.94x10 ⁷	1.56x10 ⁷
Iodines	1.7x10 ⁶	1.3x10 ⁶	1.3x10 ⁶
¹⁴ C	6.86x10 ¹¹	7.38x10 ¹¹	5.77x10 ¹¹
³ H	9.45x10 ¹¹	7.73x10 ¹¹	8.64x10 ¹¹
Total E (Sv)	1.40x10 ⁻⁷	1.49x10 ⁻⁷	1.17x10 ⁻⁷
Percentage of discharge limit L (%)	0.35	0.37	0.29
Radionuclide	Liquid discharges A [Bq]		
	2017	2018	2019
³ H	2.04x10 ¹³	1.78x10 ¹³	1.04x10 ¹³
Fission products	7.6x10 ⁷	9.0x10 ⁶	1.03x10 ⁷
Total E (Sv)	2.55x10 ⁻⁶	2.23x10 ⁻⁶	1.34x10 ⁻⁶
Percentage of discharge limit L (%)	42.5	37.3	22.3

4.2.2. Nuclear Power Plant Temelín

4.2.2.1. Solid RAW

4.2.2.1.1. Facilities for management of solid RAW

- Low level RAW

The low-level solid waste management includes the following steps:

- controlled collection and primary segregation of solid RAW by the type is performed at stable assigned places (at least 10 fixed collection points in HVB and additional may be established if needed, in particular for unit routine repairs and general overhauls). The collection points are provided with PE bags and metal bins for minor metal scrap. Solid RAW with dose equivalent rate > 0.1mSv/h are collected in shielded bins or containers. The collected waste are transported from collection points to BAPP,
- measuring and segregation of solid RAW - primary measuring and segregation of solid RAW based on their radioactivity is performed in BAPP. The measurement is performed with hand-held devices, a measuring carousel and segregation table,
- clearance of radioactive substance from a workplace - a part of solid waste suitable for clearance is officially measured to determine the content of radionuclides. The waste meeting criteria of the Act No. 263/2016 Coll. And Decree No. 422/2016 Coll. is cleared from a workplace or disposed of on the dump for solid municipal waste in Petrůvky, if not dismissed by SÚJB and complying with the criterion that "the effective dose of each member of the public during a calendar year caused by a discharge is lower than 0,01 mSv",
- solid RAW storage - waste that cannot be cleared from a workplace is stored in organized

manner using PE bags, or 200 liter galvanized drums in BAPP storage wells after low-pressure compacting (15 t),

- part of the solid RAW intended for decay storage or processing in an incinerating plant is kept loose in storage using PE bags.
- Intermediate-level waste (waste failing to meet the waste acceptance criteria for disposal in RAW disposal facility, not generating heat)

If RAW cannot be disposed in RAW disposal facility due to their high specific activity of radionuclides they are stored in the storage area for radioactive items while final treatment and disposal will be addressed in the NPP decommissioning process.

4.2.2.1.2. Facilities for processing of solid RAW

- Low-level solid waste

The part of solid waste that cannot be cleared from a workplace is processed or treated (incineration, high-pressure compacting, remelting) in external technological facilities and deposited in radioactive waste disposal facilities. Non-treated solid radioactive waste is stored in the storage facility for solid RAW.

- Intermediate-level solid RAW

Intermediate-level solid waste is not treated but only fragmented (if practicable) and kept in controlled RAW stores for radioactive items.

4.2.2.1.3. Facilities for storage of solid RAW

- Low-level solid RAW

The low-level solid RAW storage system is located in BAPP. It consists of 7 concrete rooms (storage wells) sized 7.5 x 2.5-5.4 x 3.8 m. They contain no internal structures and solid RAW is kept in drums. The room floors are built at the elevation 9 m. They are roofed with in-situ concrete blocks used for ceilings at the elevation +13.20 m. An overhead 16 t crane is mounted in the hall and used to handle monolithic panels and to load drums with solid RAW into the rooms. It is also used to handle transport containers and load drums with solid RAW onto transport vehicles. All rooms are currently used for solid RAW storage prior to their transport to RAW disposal facility. The rooms are also used for sludge storage prior to its fixation in aluminosilicate matrix. Also the bituminization product may be stored here if necessary.

- Intermediate-level solid RAW

Intermediate-level solid RAW is kept in BAPP active storage in rooms C187/1 and C187/2. Rooms contain 32 steel pipes 11.7 m long to insert cases with active items. The storage time is expected until the NPP decommissioning.

4.2.2.2. Liquid RAW

4.2.2.2.1. Facility for processing of liquid RAW

Liquid RAW generated in the process of radioactive media cleaning and processing are collected and placed in BAPP storage tanks with the volumes of 200 or 60 m³.

The technology to process radioactive concentrate into a form acceptable for RAW disposal facility Dukovany is bituminization. The bitumen-based product is then disposed in RAW disposal facility Dukovany using 200 l galvanized drums.

In 2017 175 m³ of radioactive concentrate from tank OTW20B01 was conditioned and in 2018 132 m³ from tanks OTW20B01 and OTW20B02 and in 2019 171 m³ from tank OTW20B02 were conditioned as well.

In 2017-2019 3,2 t of sludge were solidified into aluminosilicate matrix ALUSIL[®]. The total quantity of the final form acceptable for disposal in RAW disposal facility Dukovany was 6,4 m³.

Tab. 4.3 Comparison of stored RAW with the limits and conditions for storage as at December 31, 2019

Waste type	Maximum Allowable Stored Amount	Actual Stored Amount
Liquid RAW - Active Water Concentrates	520 m ³	148m ³
Liquid RAW - Used Sorbents	200 m ³	67 m ³
Solid RAW Total	500 t	61 t

4.2.2.2.2. Facilities for storage of liquid RAW

The liquid RAW storage system consists of:

- radioactive concentrate storage tanks with a total volume of 520 m³ (2 x 200 m³ + 2 x 60 m³) for two units,
- emergency tanks for radioactive concentrate and sorbets with a volume of 200 m³,
- active sorbent tanks with a volume of 200 m³ each,
- pumps and auxiliary process equipment.

Organic liquid RAW (oils) are stored in 200 l metal drums. There are safety sumps under them to accommodate the whole volume of the stored drums.

4.2.2.3. Gaseous RAW

The philosophy of processing of gaseous RAW is rather simple and it consists in separation of radioactive materials from contaminated air in the ventilation system by filtration. The following tables provide discharged gas activity data, effective doses received by a representative person and percentage of authorized discharge limit for gaseous discharges.

The authorized effective dose limit of external irradiation and the effective dose rate per representative person has been set up for NPP Temelín at 40 µSv/year by SÚJB license.

Tab. 4.4 Activity of gaseous and liquid discharges

Radionuclide	Discharges into the atmosphere A [Bq]		
	Year		
	2017	2018	2019
Noble gases	9.86x10 ¹²	1.32x10 ¹³	4.04x10 ¹²
Aerosols	2.36x10 ⁶	3.63x10 ⁸	3.2x10 ⁶
Iodines	7.79x10 ⁷	7.62x10 ⁷	3.06x10 ⁷
¹⁴ C	7.30x10 ¹¹	5.84x10 ¹¹	5.56x10 ¹¹
³ H	1.58x10 ¹²	1.78x10 ¹²	2.10x10 ¹²
Total E (Sv)	1.87x10 ⁻⁷	2.22x10 ⁻⁷	1.12x10 ⁻⁷
Percentage of discharge limit L (%)	0.47	0.56	0.28
Radionuclide	Liquid discharges A [Bq]		
	Year		
	2017	2018	2019
³ H	5.27x10 ¹³	5.11x10 ¹³	4.48x10 ¹³
Fission products	4.43x10 ⁷	6.48x10 ⁸	4.91x10 ⁷
Total E (Sv)	2.20x10 ⁻⁶	2.18x10 ⁻⁶	1.87x10 ⁻⁶
Percentage of discharge limit L(%)	73.2	72.6	62.4

4.2.3. SÚRAO

4.2.3.1. RAW disposal facility Richard

This disposal facility is used to mainly dispose institutional RAW containing artificial radionuclides. Separately from disposed RAW, there is also RAW that does not comply with WAC for disposal and are waiting to be disposed in a respective disposal facility. They mainly include sealed radionuclide sources, collected radionuclide sources from fire detectors and nuclear materials.

Tab. 4.5 Inventory of RAW disposed in the Richard disposal facility recalculated as at December 31, 2019 (incl. disposed sealed radioactive sources)

Radionuclide	Total activity [Bq]
³ H	3.09x10 ¹³
¹⁴ C	1.05x10 ¹³
³⁶ Cl	9.05x10 ⁹
⁹⁰ Sr	7.68x10 ¹²
⁹⁹ Tc	4.34x10 ⁹
¹²⁹ I	2.13x10 ⁷
¹³⁷ Cs	3.31x10 ¹⁴
²³⁹ Pu	3.78x10 ¹²
²⁴¹ Am	1.03x10 ¹³
Total activity of other radionuclides α	1.11x10¹²

Tab. 4.6 Inventory of RAW stored in the Richard disposal facility as at December 31, 2019 (incl. disposed sealed radioactive sources)

Radionuclide	Total activity [Bq]
^3H	3.87×10^7
^{14}C	6.17×10^7
^{36}Cl	0
^{90}Sr	2.40×10^{11}
^{99}Tc	0
^{129}I	1.21×10^4
^{137}Cs	4.19×10^{14}
^{239}Pu	9.12×10^1
^{241}Am	9.08×10^{12}
Total activity of other radionuclides α	3.49×10^{11}

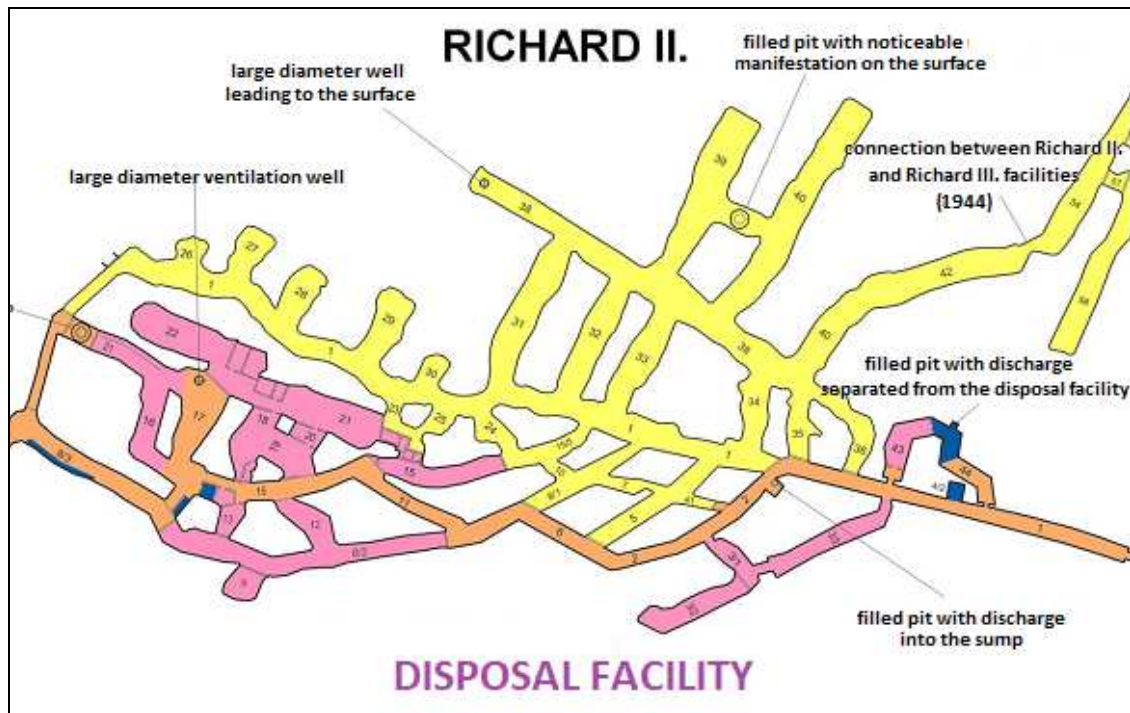


Fig. 4.6 RAW disposal facility Richard – layout (disposal chambers marked in violet)

4.2.3.2. RAW Disposal Facility Bratrství

The disposal facility is used to dispose RAW containing natural radionuclides.

Tab. 4.7 Inventory of RAW disposal facility Bratrství at December 31, 2019

Radionuclide	Total activity [Bq]
²²⁶ Ra	1.36x10 ¹²
U	6.38x10 ¹¹
²³² Th	3.20x10 ⁹

Fig. 4.7 RAW disposal facility Bratrství - layout

4.2.3.3. RAW Disposal Facility Dukovany

The disposal facility is used to dispose low- and intermediate-level waste from both the nuclear power plants on the Czech Republic's territory, and limited amount of institutional RAW.

Tab. 4.8 Inventory of RAW disposal facility Dukovany at December 31, 2019

Radionuclide	Total activity [Bq]	Radionuclide	Total activity [Bq]
¹⁴ C	2.59x10 ¹¹	⁹⁹ Tc	1.46x10 ⁹
⁴¹ Ca	3.97x10 ⁸	¹²⁹ I	5.60x10 ⁸
⁵⁹ Ni	9.46x10 ⁹	¹³⁷ Cs	1.88x10 ¹³
⁶³ Ni	1.41x10 ¹²	²³⁹ Pu	1.66x10 ⁸
⁹⁰ Sr	1.10x10 ¹¹	²⁴¹ Am	7.04x10 ⁸
⁹⁴ Nb	3.22x10 ⁹		

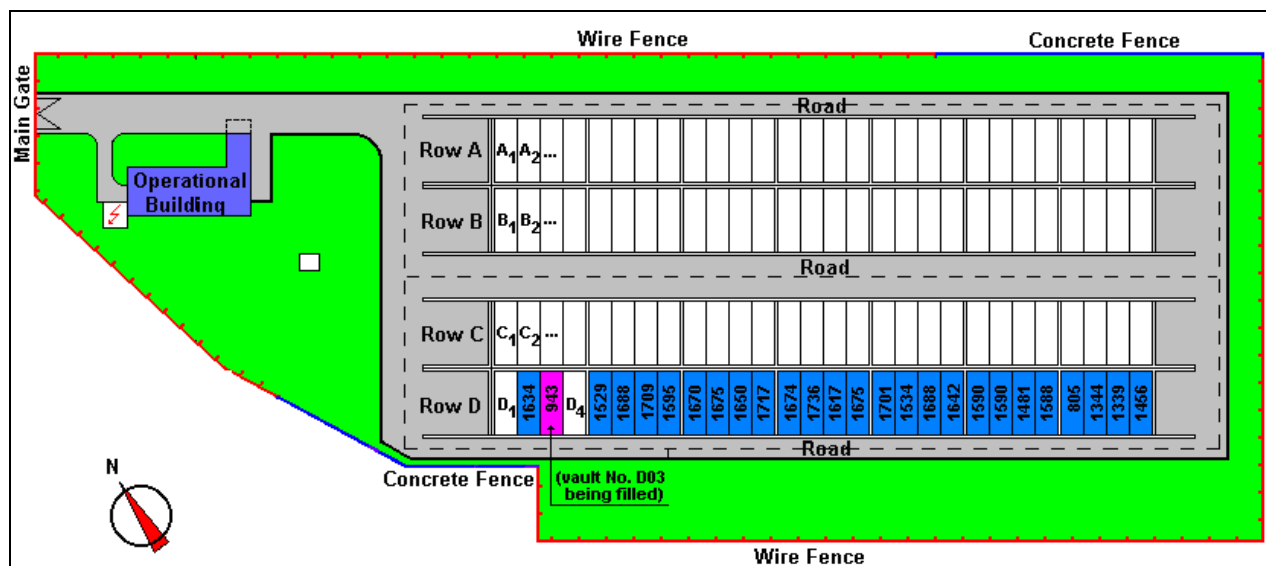


Fig. 4.8 Ground plan and current filling of the disposal units in RAW disposal facility Dukovany with casks (200 l drums, MOZAIK casks and box pallets; it does not include solid, unconditioned RAW) as at December 31, 2019

4.2.3.4. RAW Disposal Facility Hostim

The disposal facility was used to dispose institutional RAW and has now been closed. Based on conservative evaluation of documents and radiation monitoring results, the inventory as shown in Table 4.9 below was calculated in 1991.

Tab. 4.9 Inventory of RAW disposal facility Hostim - activity re-calculation in 1991

Radionuclide	Total activity [Bq]	
	Gallery A	Gallery a B
³ H	Estimate: Gallery A. equivalent max. 10 ¹⁰ Bq (the range of radionuclides produced in the former ÚJF)	1.0x10 ¹¹
¹⁴ C		2.0x10 ¹⁰
¹³⁷ Cs		1.3x10 ¹⁰
⁹⁰ Sr		1.3x10 ¹⁰
⁶⁰ Co		5.8x10 ⁸
²²⁶ Ra		3.3x10 ⁷
⁶³ Ni		1.9x10 ⁶
²⁰⁴ Tl		1.5x10 ⁶
¹⁴⁷ Pm		1.1x10 ⁵
Total activity of long-lived radionuclides α *)	max. 10 ¹⁰	ca 10 ¹¹
Total activity of short-lived radionuclides **)	< 10 ¹¹	

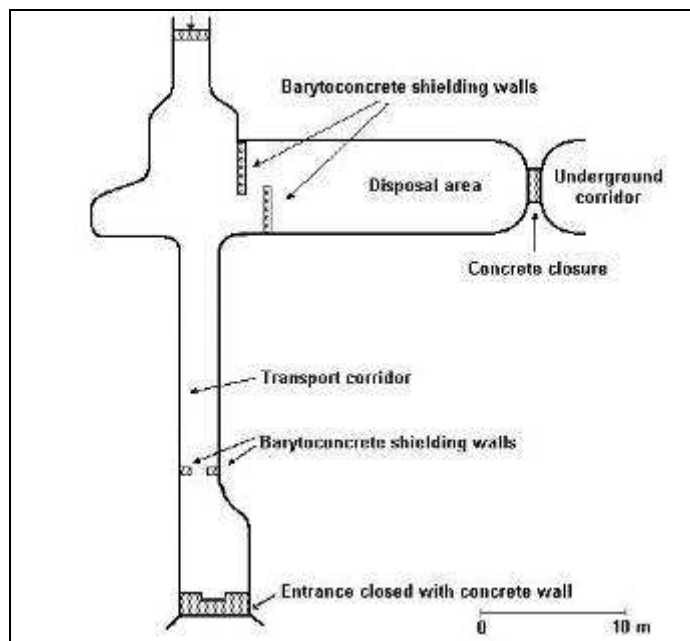


Fig. 4.9 RAW disposal facility Hostim – section

4.2.4. ÚJV Řež, a. s.

4.2.4.1. Building 241 - Velké zbytky - RAW Management Facility

The facility is used to store only RAW before treatment and RAW after the processing till the transport for disposal. The maximum volume of low and intermediate-level waste stored before processing is 112.2 m³ (liquid RAW) and 173 m³ (solid RAW) and 150 m³ for temporary solid RAW. The maximum volume of processed RAW, which can be stored in the building, is 32 m³.

4.2.4.2. Building 211/6 - RAW Re-loading Facility

Tab. 4.10 Quantities of LILW in building 211/6

Box No.	RAW Volume [m ³]
box No. 1	0
box No. 2	0
box No. 3	0
box No. 4	0
box No. 5	0
box No. 6	0
box No. 7	0
box No. 8	0
Handling area	0
	0
Total	0

4.2.4.3. Building 211/8 - HAW Storage Facility

Tab. 4.11 Quantities of low and intermediate-level solid RAW

Box No.	RAW volume [m ³]
I	33.75
II	40.88
III	1.20
IV	45.36
V	8.42
Total	129.61

The estimated total activity of RAW stored is 3.96 GBq (isotopes ¹³⁷Cs, ²⁴¹Am).

Tab. 4.12 SF inventory

SF	Qty	Location	Estimated activity	Prevailing radionuclides
No SF was stored in the HAW Storage Facility at December 31, 2019.				

5. Legislative and Regulatory System– Articles 18 – 20 of the Joint Convention

5.1. Implementing Measures

Article 18 of the Joint Convention:

Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

All steps leading to fulfillment of the JC in terms of legislative, regulatory and administrative activities are summed up particularly in Articles 19, 20 and detailed in the individual relevant articles of the National Report.

5.2. Legal and Regulatory Framework

Article 19 of the Joint Convention:

- 1 Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.*
- 2. This legislative and regulatory framework shall provide for:*
 - (i) the establishment of applicable national safety requirements and regulations for radiation safety;*
 - (ii) a system of licensing of spent fuel and radioactive waste management activities;*
 - (iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a license;*
 - (iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;*
 - (v) the enforcement of applicable regulations and of the terms of the licenses;*
 - (vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management*
- 3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.*

5.2.1. Currently Valid Legislation in Utilization of Nuclear Energy and Ionizing Radiation

Article 5 of the Directive:

- 1. Member States shall establish and maintain a national legislative, regulatory and organizational framework ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:*
 - (b) national arrangements for the safety of spent fuel and radioactive waste management. The determination of how those arrangements are to be adopted and through which instrument they are to be applied rests within the competence of the Member States;*

The history of the Czech nuclear safety and radiation protection legislation was described in the National Report of the Czech Republic under the Joint Convention, Revision 1.1 of February 2003.

The Act No. 18/1997 Coll., on peaceful utilization of nuclear energy and ionizing radiation (Atomic Act) and on changes in and amendments to some other acts, has been since 1 January 2017 replaced with a new atomic act adopted on 14 July 2016, i.e. the Act No. 263/2016 Coll., Atomic Act. The act incorporates applicable regulations of the European Communities and the European Union for atomic energy, it relates directly to applicable regulations of Euratom and the European Union and it regulates:

- a) conditions for peaceful utilization of nuclear energy,
- b) conditions for performance of activities in exposure situations,
- c) management of radioactive waste and spent nuclear fuel,
- d) type-approval of certain products for peaceful utilization of nuclear energy and ionizing radiation and conditions for transport of radioactive or fissile materials, radioactive waste or spent nuclear fuel,
- e) monitoring of radiation situation,
- f) radiation extraordinary event management,
- g) conditions for protection of nuclear installations, nuclear material and sources of ionizing radiation,
- h) requirements for assurance of non-proliferation of nuclear weapons and
- i) execution of public administration in the sphere of peaceful utilization of nuclear energy and ionizing radiation.

The Act No. 18/1997 Coll. remains in effect in its residual form and it only regulates responsibility for nuclear damage. The Act has been amended by Act No. 264/2016 Coll. that changes some other acts in connection with adoption of the Atomic Act.

New implementing regulations have been prepared and published to the new Atomic Act, as listed in chapter 12.6 in a complete list of legal regulations dealing with nuclear energy, ionizing radiation and related regulations. A full wording of the Atomic Act and its implementing decrees is provided on the SÚJB website (<http://www.sujb.cz>).

Requirements for management of radioactive waste (RAW from nuclear installations and institutional radioactive waste) are defined in the Atomic Act and in the Decree No. 377/2016 Coll., on requirements for safe management of radioactive waste and decommissioning of nuclear installations or workplaces of category III or IV.

The Czech legislation in the given area includes, by means of reference in the Atomic Act and in other regulations, international treaties acceded by the Czech Republic (or by the former ČSSR and later ČSFR) (see the National Report under the Joint Convention, Revision 2.3 of September 2005).

In addition to the international documents mentioned above, the Czech Republic has signed the Comprehensive Nuclear Test Ban Treaty, however, it has not come into effect yet. The Czech Republic is also a pro-active member of IRS, INES and ENATOM within the IAEA systems.

The duty to inform about significant events affecting nuclear safety is also established in bilateral agreements entered by the Czech Republic, or by its predecessors, in the past (see the National Report under the Joint Convention, Revision 2.3 of September 2005).

5.2.2. Approval Process, Inspections and Enforcement of Compliance

Article 5 of the Directive:

1. *Member States shall establish and maintain a national legislative, regulatory and organizational framework ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:*
 - (c) *a system of licensing of spent fuel and radioactive waste management activities, facilities or both, including the prohibition of spent fuel or radioactive waste management activities, of the operation of a spent fuel or radioactive waste management facility without a license or both and, if appropriate, prescribing conditions for further management of the activity, facility or both;*
 - (d) *a system of appropriate control, a management system, regulatory inspections, documentation and reporting obligations for radioactive waste and spent fuel management activities, facilities or both, including appropriate measures for the post-closure periods of disposal facilities;*
 - (e) *enforcement actions, including the suspension of activities and the modification, expiration or revocation of a license together with requirements, if appropriate, for alternative solutions that lead to improved safety;*

The fundamental laws governing the licensing and approval process for nuclear installations lies are the previously mentioned Building Act (No. 183/2006 Coll.) and the Atomic Act. Other important regulations in this legal area include the Act No. 500/2004 Coll., the Code of Administrative Procedure, the Act No. 255/2012 Coll., Inspection Code, the Act No. 244/1992 Coll., on assessment of impacts of development concepts and programs on the environment, the Act No. 100/2001 Coll., on assessment of impacts on the environment, and the Act No. 106/1999 Coll., on free access to information, and related legal regulations with a lower legal force.

Pursuant to the Building Act, issuance of the fundamental resolution for any building project with nuclear installations, i.e. a planning permit about location of a structure, is in the competence of the Ministry of Regional Development. The other permits for such building projects (building permit, final inspection approval and permit for removal of a structure) are now in the competence of the Ministry of Industry and Trade of the Czech Republic

The approval proceedings in the matter of issuance of a decision about location of a structure and removal of a structure with a nuclear installation are preceded by a separate process of environmental impact assessment pursuant to the Act No. 100/2001 Coll., which imposes the obligation to assess construction projects from the viewpoint of their impact on the environment (the so-called EIA process). Parties involved in this process include affected local governments, state authorities and the general public represented by physical persons and associations. The respective authority responsible for issuance of a position regarding the impact of nuclear plant on the environment shall be the Ministry of the Environment.

In the case of a construction project with a nuclear installation the Building Act establishes a three-stage permitting procedure which consists of a planning permit, building permit and final inspection approval. The competence of the building office to issue the planning permit (location of the structure) is executed by the Ministry of Regional Development. The building permit and the final inspection approval (for permanent operation) are provided by a special building office of the Ministry of Industry and Trade.

If the proceedings may affect interests protected by special regulations, such as nuclear safety or radiation protection, the building office shall decide in agreement with, or with the approval of, competent public administration agencies that defend such interests. The competent public administration agency may make their approval conditional on meeting of conditions set in their resolutions issued in agreement with a special act that entitles the agency to do so. The Building Act directly requests the applicant and the building owner to submit to the competent authorities, as a part of the documentation, binding positions or resolutions provided by affected agencies under special regulations; resolutions by the building office are therefore bound by positions or resolutions of specialized state regulatory agencies, including SÚJB.

The Atomic Act specifies activities requiring a license from SÚJB. Licenses are issued by SÚJB in administrative proceedings which are separate from the procedure under the Building Act described above. The Atomic Act explicitly prohibits launching of location, construction or operation of a nuclear installation and other activities requiring a license from SÚJB before the SÚJB license comes into legal force.

Apart from the main licenses for siting, construction and operation, there are many other activities requiring licenses for:

- the individual stages of commissioning of the nuclear installation,
- carrying out of modifications affecting nuclear safety, technical safety and physical protection of a nuclear installation,
- carrying out of reconstruction or other modifications affecting radiation protection, radiation situation monitoring and radiation extraordinary event management ,
- the clearance of a radioactive substance from a workplace, etc.

Apart from the a three stage process required by the Building Act, as described above, the permitting process includes a number of other separate licenses issued by SÚJB in agreement with the Atomic Act in various stages of the lifecycle of the nuclear installation, as defined particularly in Section (§) 9 of the Atomic Act. Other provisions of the Atomic Act define prerequisites for issuance of the license (Section (§) 13), good repute and professional competence of the applicant for a license (Section (§) 14 and Section (§) 15), application for the license (Section (§) 16), procedure conducted by SÚJB in the administrative proceedings (Section (§) 19), particulars and period of license validity (Section (§) 21) and a new resolution about issuance of the license, cancelation and lapse of the license (Section (§) 22).

SÚJB inspection activities are regulated by the Atomic Act and also by the Act on inspection No. 255/2012 Coll., Inspection Code, which defines general rules for administrative authorities for the performance of inspection activities. The two mentioned acts grant to SÚJB the appropriate powers and competences to perform the state surveillance. SÚJB supervises compliance with requirements of the Atomic Act and other regulations issued based on the act, while paying particular attention to holders of licenses issued pursuant to Section (§) 9 of the Atomic Act.

The inspections are performed by SÚJB inspectors appointed by the SÚJB chairperson. The SÚJB inspectors and the chairperson are authorized to be involved in investigation and management of events important from the viewpoint of nuclear safety, radiation protection, physical protection and radiation extraordinary event management, including unauthorized management of nuclear items or sources of ionizing radiation.

Enforcement measures for the compliance with legislative requirements are set in Sections (§§) 200 -204 and Sections (§§) 175 - 199 of the Atomic Act and they include the power of SÚJB to

require correction of found shortcomings and to set a time limit for the correction, to request notification about the method of performance and completion of the imposed measure and to impose fines for non-performance of obligations under the Atomic Act. SÚJB shall be entitled to withdraw the authorization for special professional competence from workers of a nuclear installation if they breach their obligations (Section (§) 33).

In the case of danger of delay SÚJB may order to reduce power or to stop operation of a nuclear installation, to limit or to suspend performance of licensed activities, as long as the licensee breaches its obligations. A new decision on the issue of a license and cancellation and lapse of a license are governed by Section (§) 22 of the Atomic Act.

5.3. Regulatory Bodies

Article 20 of the Joint Convention:

- 1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence, financial and human resources to fulfill its assigned responsibilities.*
- 2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.*

Article 6 of the Directive:

- 1. Each Member State shall establish and maintain a competent regulatory authority in the field of safety of spent fuel and radioactive waste management.*

The Act No. 21/1993 Coll. of 21 December 1992 established SÚJB which on 1 January 1993 took over execution of the state surveillance over nuclear safety in the Czech Republic after the former ČSKAE. Its sphere of authority has been complemented with the Act No. 287/1993 Coll., on the sphere of authority of the State Office for Nuclear Safety and the Act No. 85/1995 Coll. In July 1995, the authority of the SÚJB was extended into the area of protection against ionising radiation. On the basis of this decision, the supervisory authorities in the field of nuclear safety and radiation protection have been joined in the Czech Republic. The SÚJB thus became a unified administrative office for the area of use of nuclear energy and ionising radiation.

In 2014, as a result of changes in Czech legislation, particularly the newly effective Act No. 255/2012 Coll., on inspection (Inspection Code), an amendment to the Atomic Act was issued in the part concerning inspection activities of SÚJB.

As provided above in chapter 5.2.1, on 14 July 2016 the new Atomic Act No. 263/2016 Coll., was adopted which has replaced the preceding Act No. 18/1997 Coll. The new Atomic Act became effective on 1 January 2017 and it has incorporated applicable regulations of the European Communities and of the European Union for atomic energy and it relates directly to applicable regulations of Euratom and the European Union.

5.3.1. Mandate and Competence of the Regulatory Body

Article 6 of the Directive:

- 3. Member States shall ensure that the competent regulatory authority is given the legal powers and human and financial resources necessary to fulfil its obligations in connection with the*

national framework as described in Article 5(1) (b), (c), (d) and (e).

Pursuant to the Atomic Act SÚJB is an agency and a central administrative authority for utilization of nuclear energy and ionizing radiation (Section (§) 206, Section (§) 207). The SÚJB sphere of authority is defined in Section (§) 208 and Section (§) 209 of the Atomic Act.

Pursuant to Section (§) 208 of the Atomic Act the Office shall:

- a) issue licenses for the performance of activities and register and receive notifications of activities,*
- b) type-approve packaging assemblies for the carriage, storage or disposal of radioactive or fissile materials, sources of ionizing radiation and other products,*
- c) grant authorizations for the performance of activities of particular relevance to nuclear safety and radiation protection*
- d) approve documentation for licensed activities,*
- e) establish emergency planning zones,*
- f) monitor and assess the exposure situation and regulate exposure of natural persons, including exposure from natural sources of radiation and draw up, in cooperation with the relevant administrative authorities, national plans to address and provide information about situations,*
- g) issue, register and verify individual radiological monitoring documents,*
- h) maintain lists and registers in the area of the peaceful uses of nuclear energy and ionizing radiation, including lists and registers according to international treaties binding on the Czech Republic,*
- i) establish the design basis threat,*
- j) perform the role of the organization for international verification of compliance with the comprehensive nuclear test ban,*
- k) ensure international cooperation within the field of its competence, provide information from the field of its competence to the International Atomic Energy Agency, the Euratom and other authorities of the Euratom and ensure implementation of other obligations arising from Euratom legislation relating to, in particular, the national and international evaluation of the exercise of State Authority over nuclear safety of nuclear installations and management of nuclear materials and high-activity sources,*
- l) decide on the management of nuclear items, sources of ionizing radiation or radioactive waste in the cases where they are managed in conflict with legislation or a situation that has arisen is not being rectified, including cases when these have been found, and, if necessary, organize a search for such sources of ionizing radiation,*
- m) once a year, present to the Government and to the public a report on its activities and an annual report on radiation situation monitoring in the territory of the Czech Republic,*
- n) submit opinions on territorial development policies and territorial planning documentation in terms of nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security of activities related to the use of nuclear energy and activities in exposure situations*
- o) provide information in the area of radioactive waste management and spent fuel,*
- p) issue binding opinions on spatial planning decisions concerning construction on land where a closed radioactive waste disposal facility is sited; the binding opinions shall express if the intended plan is acceptable from a perspective of radiation protection and monitoring of radiation situation and set down conditions for assurance of radiation protection and monitoring of radiation situation relevant to this plan,*

- q) *issue binding opinions in proceedings and other actions relating to nuclear installations under the building act,*
- r) *provide information on important findings obtained in the context of its control activities and from reporting on radiation extraordinary events and radiological occurrences, including information relating to the justification of activities, regulation of sources of ionizing radiation and radiation protection,*
- s) *draw up and update the national action plan for regulation of public exposure from radon and define the concept for the management of existing exposure situations,*
- t) *inform the general public about potential risks of exposure from a source of water for an individual supply providing on average less than 10 m³ a day, or serving fewer than 50 persons, unless the water is supplied as part of a commercial activity or public service.*

Pursuant to Section (§) 209 of the Atomic Act the Office shall:

- a) *draw up the national monitoring programme and, after it has been approved, forward it to the persons referred to in § 149(2)(a),*
- b) *manage and carry out radiation situation monitoring on the territory of the Czech Republic in accordance with § 149, including the comparative measurements organized by the European Commission, evaluate its results and report radiation situation monitoring data to the European Commission,*
- c) *ensure and conduct drills and emergency exercises for radiation extraordinary event response,*
- d) *in cooperation with the Ministry of the Interior, draw up the national radiation extraordinary event plan for threat categories A, B, D and E in accordance with § 153(1),*
- e) *provide preliminary information to the general public for the event of a radiation accident, concerning protective measures and steps that need to be taken to ensure radiation protection; the preliminary information provided shall be up-to-date and constantly available and it shall be provided automatically and repeatedly, at regular intervals and whenever a significant change occurs,*
- f) *issue proposals for urgent protective action or follow-up protective action, in accordance with the national radiation extraordinary event plan and on the basis of the results of the radiation situation monitoring carried out, or to further specify or withdraw the action and to confirm or further specify proposals for the introduction of urgent protective action issued by license holders,*
- g) *ensure information of the general public about the occurrence and the course of a radiation accident which has an impact on the territory of the Czech Republic outside an emergency planning zone and about the steps and measures to be taken during the various stages of development of the radiation accident, unless this information is being provided by another administrative authority,*
- h) *participate, within the scope of its competence, in the provision of information about the occurrence and the course of a radiation accident within an emergency planning zone,*
- i) *ensure that the competent regulatory authorities of neighboring Member States of the Euratom are notified of the occurrence and the course of a radiation accident which has an impact on the territory of the Czech Republic and about the steps and measures to be taken during the various stages of development of the radiation extraordinary event,*
- j) *ensure that an international peer review is invited immediately in the case of a radiation accident that has occurred in the territory of the Czech Republic and led to the implementation of protective measures outside a nuclear installation grounds,*

- k) *provide information about the adoption of measures to protect the general public in the Czech Republic in the event of a radiation accident arisen in the territory of Member States of the Euratom to the European Commission and other Member States of the Euratom which may be affected by these measures and, in accordance with the Czech Republic's international commitments, provide public access to information thus obtained,*
- l) *ensure notification of regional authorities about the occurrence and the course of a radiation accident outside the territory of the Czech Republic and about the steps and measures to be taken in the course of the radiation extraordinary event.*

The SÚJB competence was further extended by the Act No. 249/2000 Coll., on execution of state administration and inspection of chemical weapons ban, and by the Act No. 281/2002 Coll., on some measures associated with the ban on bacteriological (biological) and toxin weapons.

5.3.2. Specification of Powers and Responsibilities of the Regulatory Body

Section (§) 9 of the Atomic Act sets forth following conditions for utilization of nuclear energy and ionizing radiation:

- (1) *A license from the Office shall be required for performing the following activities related to the use of nuclear energy:*
 - a) *the siting of a nuclear installation,*
 - b) *the construction of a nuclear installation,*
 - c) *the first physical start-up of a nuclear installation with a nuclear reactor,*
 - d) *the first power-generation start-up of a nuclear installation with a nuclear reactor,*
 - e) *the commissioning of a nuclear installation without a nuclear reactor,*
 - f) *the operation of a nuclear installation,*
 - g) *the individual phases of decommissioning of a nuclear installation, and*
 - h) *the carrying out of modifications affecting nuclear safety, technical safety and physical protection of a nuclear installation.*
- (2) *A license from the Office shall be required for carrying out the following activities in exposure situations:*
 - a) *the construction of a category IV workplace, except workplaces with a nuclear installation,*
 - b) *the operation of category III workplace or category IV workplace,*
 - c) *the carrying out of reconstruction or other modifications affecting radiation protection, radiation situation monitoring and radiation extraordinary event management in a category III workplace or category IV workplace; implementing legislation shall establish list of modifications affecting radiation protection, radiation situation monitoring and radiation extraordinary event management in a category III workplace or category IV workplace,*
 - d) *the individual phases of decommissioning of a category III workplace or a category IV workplace,*
 - e) *the discharge of a radioactive substance from a workplace, if not set otherwise by this act,*
 - f) *the management of a source of ionizing radiation, namely*
 - 1. *the production of a source of ionizing radiation, except the manufacture of a radiation generator which is an insignificant source of ionizing radiation,*

2. *the import of a source of ionizing radiation, except the import of a source of ionizing radiation for own use or import of a radiation generator,*
 3. *the export of a source of ionizing radiation, except the export of a source of ionizing radiation for own use, export of an insignificant or minor source, or export of a radiation generator,*
 4. *the distribution of a source of ionizing radiation, except the distribution of a radiation generator,*
 5. *the installation or commissioning of a source of ionizing radiation, except the installation or commissioning of a source of ionizing radiation which is performed by a person authorized to use the source of ionizing radiation and which is not associated with a risk of exposure greater than in normal use,*
 6. *the operation of a recognized storage facility for the purposes of storing a radionuclide source,*
 7. *the use of a source of ionizing radiation, except the use of consumer products containing added radionuclide, the production, import or export of which was authorized, a source of ionizing radiation which is an integral part of technological systems or operating media in a workplace which the user is authorized to operate on the basis of a license under (b), a source of ionizing radiation used only to an extent falling within the user's authorization under other licenses, and the use of a source of ionizing radiation, which has been registered by the office or of which the office has been notified,*
 8. *the evaluation of the characteristics of a source of ionizing radiation by type-approval testing of the source of ionizing radiation, conformity assessment of the properties of a source of ionizing radiation pursuant to other legislation, acceptance testing of a source of ionizing radiation, except unsealed radionuclide sources, and long-term stability testing of a source of ionizing radiation,*
 9. *the repair and servicing of sources of ionizing radiation, except repair and servicing of radiation generators that cannot be associated with exposure of natural persons, and repair and servicing performed by the licensee for using this source, unless the repair is associated with a risk of potential exposure greater than in normal use, and*
 10. *the management of products of activity related to acquiring of radioactive minerals and deposited in tips and sludge lagoons,*
- g) the addition of a radioactive substance to a consumer product when manufacturing or preparing it and for importing and exporting such a consumer product,*
- h) the performance of services relevant to radiation protection, namely*
1. *the performance of personal dosimetry, including for own needs,*
 2. *the determination of personal doses of workers in a workplace with potentially increased exposure to a natural source of radiation and in a workplace with potentially increased exposure to radon,*
 3. *the monitoring of a category III workplace or category IV workplace, discharges from this workplace, the area surrounding it, the area surrounding a radioactive waste disposal facility after closure of the radioactive waste disposal facility, tips, settling ponds or other residues of activity related to acquiring of radioactive minerals or other mining activity accompanied by the occurrence of a radioactive mineral, and monitoring for the purposes of siting or constructing a nuclear installation,*
 4. *the continuous surveillance of radiation protection (hereinafter "continuous surveillance") by the supervising person,*

5. *the measurement and assessment of indoor exposure to natural sources of radiation for the purposes of preventing radon penetration indoors under § 100 or protection against natural indoor radiation under § 99 and determination of the building site radon index under § 98,*
 6. *the measurement and assessment of natural radionuclide content of water under § 100(2)(a) and of construction products and materials expected to have an increased natural radionuclide content, which are intended to be installed in structures with residential rooms or rooms intended to be occupied by persons (hereinafter “building materials”) under § 101(2)(a), and*
 7. *the measurement and evaluation of the radionuclide content of a radioactive substance discharged from a workplace with potentially increased exposure to a natural source of radiation under § 95(1)(b),*
 - i) *the provision of services in the controlled area to the operator of a category IV workplace, except cases where the activity is performed sporadically or there is danger in delay and where the operator of the controlled area has demonstrably satisfied all the requirements for radiation protection of the workers performing this activity,*
 - j) *the making available on the market of building materials, if the effective dose to a representative person from using the building material exceeds 1 mSv per year from external exposure; a list of building materials shall be established by implementing legislation, and*
 - k) *the mixing of radioactive substances discharged from a workplace under § 93(1)(b) for the purpose of reusing or recycling them.*
- (3) *A license from the Office shall be required for the following activities in the area of radioactive waste management:*
- a) *radioactive waste management, except collection, segregation and storage of radioactive waste directly by the radioactive waste producer, who is authorized to manage the waste as an unsealed radionuclide source,*
 - b) *the closure of a radioactive waste disposal facility,*
 - c) *the re-import of radioactive waste produced during the processing of a material exported from the Czech Republic or re-transfer thereof from a Member State of the Euratom, and*
 - d) *the import or transfer of radioactive waste from a Member State of the Euratom to the territory of the Czech Republic for the purposes of processing or reusing it.*
- (4) *A license from the Office shall be required for carriage of radioactive or fissile materials, specifically for*
- a) *carriage of fissile material; implementing legislation shall establish the rules for determining fissile materials the carriage of which shall be subject to licensing, their categorization, requirements on them and the technical requirements for determining the packaging assembly for carrying fissile materials and requirements on it,*
 - b) *carriage of radioactive substances; implementing legislation shall establish the rules for determining radioactive substances the carriage of which shall be subject to licensing, their categorization, requirements on them and the technical requirements for determining the packaging assembly for carrying radioactive substances and requirements on it,*
 - c) *carriage of radioactive or fissile materials under special conditions if, taking into account the economic and societal circumstances, it is not possible to satisfy all the requirements under this Act or other legislation and these requirements are replaced by specific*

requirements, which ensure the same or higher level of nuclear safety, radiation protection, physical protection and radiation extraordinary event management during carriage and

- d) transboundary shipments of radioactive waste or spent fuel, if their activity and the activity concentration of radionuclides contained in them exceed the clearance levels established in implementing legislation and where the State of origin, State of destination or the first State of transit through the Euratom is the Czech Republic, except shipments of radioactive waste or spent fuel from a Member State of the Euratom to the Czech Republic or transit thereof through the Czech Republic, if the Czech Republic is not the first State of transit through the Euratom which the radioactive waste or spent fuel enters*

(5) A license from the Office shall be required for the following activities in the area of non-proliferation of nuclear weapons:

- a) the management of nuclear material and
b) the import or export of a nuclear item or transit of nuclear material and a selected nuclear item.*

(6) A license from the Office shall be required for

- a) training and further training of workers performing activities of particular relevance to nuclear safety and radiation protection (hereinafter “selected worker”) and
b) training of a natural person ensuring the radiation protection of a person who has been registered under this Act (hereinafter the “registered person”).*

(7) A license from the Office shall be required for complete decommissioning.

(8) Any activity for which a license from the office is required, except the activities referred to in paragraph 2(h) and (i) and paragraph 6, shall not be a service as defined under the act on the free movement of services. A license from the office shall also be required for an activity performed by a person with registered office or permanent residence in another Member State of the European Union who is a holder of authorization for performing this activity in that State.

Other provisions of the Atomic Act define:

- Licensing and registration prerequisites (Section (§) 13),
- Good repute and professional competence of an applicant for the license (Section (§) 14 and Section (§) 15),
- License application (Section (§) 16),
- Procedure followed by SÚJB when issuing licenses (Section (§) 19),
- Particulars and period of validity of a license (Section (§) 21),
- New decision on the issue of a license and cancellation and lapse of a license (Section (§) 22).

SÚJB supervises compliance with the Atomic Act, legal regulations issued for its implementation and obligations resulting from international treaties by which the Czech Republic is bound, as long as they are relevant for peaceful utilization of nuclear energy and ionizing radiation, compliance of resolutions issued based on the Act and fulfilment of obligations imposed by the Act on metrology in the case of measuring instruments intended or used for measurement of ionizing radiation and radioactive substances. Exercise of state authority in controls and corrective measures is regulated in part four of the Atomic Act, which includes:

- subject matter of controls, persons conducting controls and special rules for the conduct of controls (Sections (§§) 200 through 202),

- binding orders of the inspectors (Section (§) 203),
- corrective measures (Section (§) 204),
- infringements, administrative offences and imposing of fines (Sections (§§) 175 through 199).

The Atomic Act, together with the Act No. 255/2012, Inspection Code, provide SÚJB with sufficient powers to execute the state supervision, as well as coercion means to enforce compliance with legal requirements for nuclear safety and radiation protection.

The SÚJB personnel performing the supervision are inspectors appointed by the SÚJB chairperson. They are based at the SÚJB headquarters, as well as at Dukovany and Temelín NPP sites and in regional centers.

SÚJB inspects:

- a) licensees, registered persons and notifying persons,
- b) manufacturers, importers and distributors of products the type of which has been approved by the Office,
- c) persons performing activities within peaceful utilization of nuclear energy and ionizing radiation that do not require an authorization under the Act,
- d) persons involved in monitoring of radiation situation,
- e) holders of license for performance of activities particularly important from the viewpoint of nuclear safety and radiation protection,
- f) authorized and accredited persons performing evaluation of conformity of selected equipment with technical requirements and
- g) other persons justifiably suspected of breaching the obligation under the Act or obligations resulting from international treaties by which the Czech Republic is bound, as long as they are relevant for peaceful utilization of nuclear energy and ionizing radiation.

Based on a completed inspection the inspector shall be authorized to prohibit activities not performed in agreement with the requirements of this Act and, in the case of danger of delay, until the problem is corrected, specifically:

- a) management of nuclear materials or other sources of ionizing radiation,
- b) release of radioactive substances from workplaces,
- c) adding of radioactive substances into consumer products during its manufacturing or preparation or import and export of such a consumer products,
- d) performance of services important from the viewpoint of radiation protection,
- e) provision of services in the radiation control area to an operator of workplaces of category IV,
- f) supplying to the market of building material that requires a license under this Act,
- g) management of radioactive waste,
- h) reimport of radioactive waste generated by processing of material exported from the Czech Republic and its reverse transfer from an Euratom member state,
- i) import of radioactive waste to the Czech Republic or its transfer from an Euratom member state for the purposes of its processing or reuse,
- j) transport of radioactive or fissile materials,
- k) import or export of nuclear items or transit of nuclear material and selected items in the nuclear area,
- l) performance of activities particularly important from the viewpoint of nuclear safety and radiation protection, or
- m) usage, manufacturing, import or distribution of a product the type of which was not approved by the Office, even though it should have been approved under the Act.

In the case of a proved finding of unauthorized management of radioactive waste or nuclear material or another source of ionizing radiation the inspector shall be authorized to order seizure of the radioactive waste or source ionizing of radiation until a legitimate resolution is made about its forfeiture or confiscation or until it has been proved that the inspected person is authorized to manage the material.

In the case of danger of delay or in the case of undesired facts important from the viewpoint of nuclear safety, radiation protection, physical protection and radiation extraordinary event management, SÚJB shall be entitled to issue a provisional order that orders the inspected person to reduce the power output or to suspend operation of the nuclear installation, to stop assembling of components or systems of the nuclear installation, to prohibit management of nuclear items, sources of ionizing radiation or RAW or the obligation to sustain the management by another person at the expense of the inspected person.

Section (§) 22 of the Atomic Act, dealing with a new decision on the issue of a license and cancellation and lapse of a license, authorizes SÚJB to limit or to suspend performance of a licensed activity if the licensee breaches its obligations.

SÚJB may impose a fine for violation of a legal obligation under the Atomic Act depending on the nature of the administrative offence up to the amount indicated in Sections (§§) 175 – 197.

Internal acts by SÚJB contain binding procedures for SÚJB workers for execution of the supervisory activity.

5.3.3. Position of the Regulatory Body within the State Administration Structure

Article 6 of the Directive:

- 2. Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organization concerned with the promotion or utilization of nuclear energy or radioactive material, including electricity production and radioisotope applications, or with the management of spent fuel and radioactive waste, in order to ensure effective independence from undue influence on its regulatory function.*

SÚJB, as the successor of ČSKAE, is an independent central state administration body in the field of nuclear safety and radiation protection. It has its own budget item approved by the Parliament of the Czech Republic as part of the national budget. SÚJB is headed by a Chairperson appointed by the Czech Government. The SÚJB position in the state administration structure is shown in Fig. 5.1.

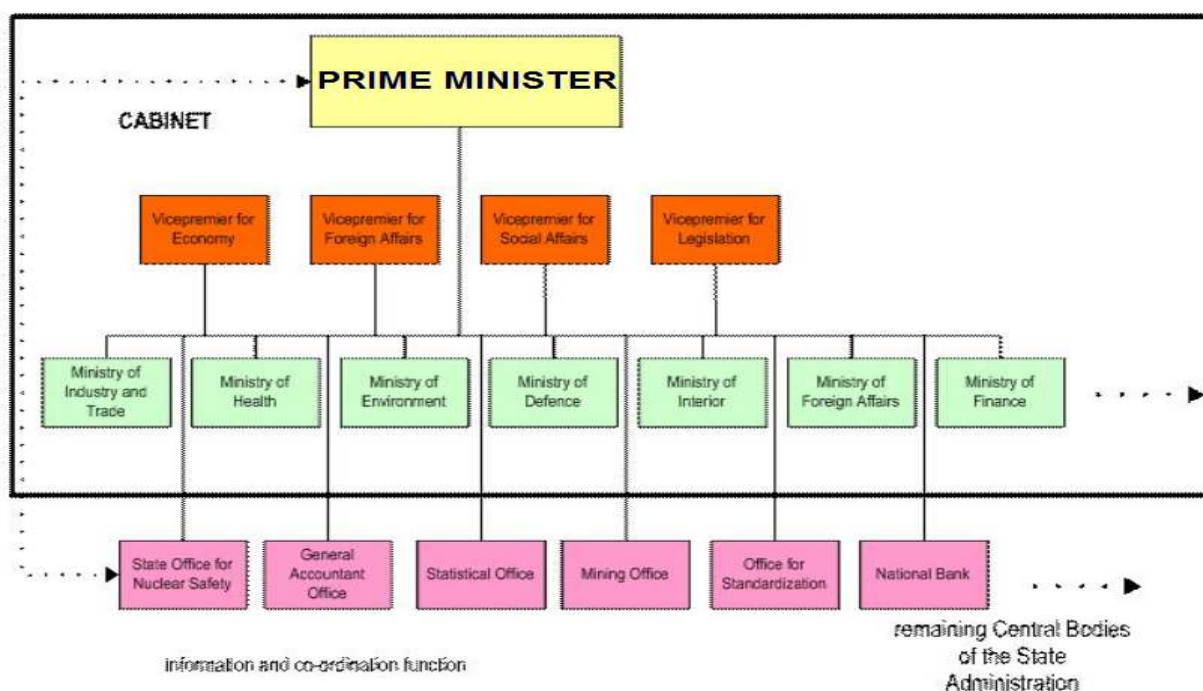


Fig. 5.1 Position of SÚJB within the structure of government bodies

5.3.4. Regulatory Body Structure, Technical Support and Material and Human Resources

The number of positions approved in the SÚJB budget for 2020 is 215 of which approximately 2/3 are SÚJB inspectors. The approved SÚJB budget for 2019 was approximately 429.801 mil. CZK and its implementation was 422.401 mil. CZK. In the current situation of the Czech Republic, the material and human resources are sufficient to provide for the basic functions imposed by law.

The SÚJB organizational structure is shown in Fig. 5.2.

The Table 5.1 below shows basic indicators of SÚJB financial management in 2014-2019. The total revenues in 2019 were exceeded by 4 216 thous. CZK. Savings of 36 610 thous. CZK were achieved in comparison with the budget of expenses. Since 2011 funding of science and research has been transferred to agencies and to the Ministry of Education, Youth and Sports.

Tab. 5.1 Summary data about the SÚJB financial management (in thous. CZK)

	2014	2015	2016	2017	2018	2019
Total revenues	184 961	176 718	180 244	184 900	185 697	174 616
Total expenses	324 447	342 773	351 654	402 121	394 983	422 401
from which						
- science and research	0	0	0	0	0	0
- expenses on programing funding	109 175	123 312	109 175	160 835	146 452	169 241
- wages and other payments	104 741	115 216	104 741	122 936	134 032	139 118
- other current expenses	110 531	104 245	110 531	118 350	114 499	114 042

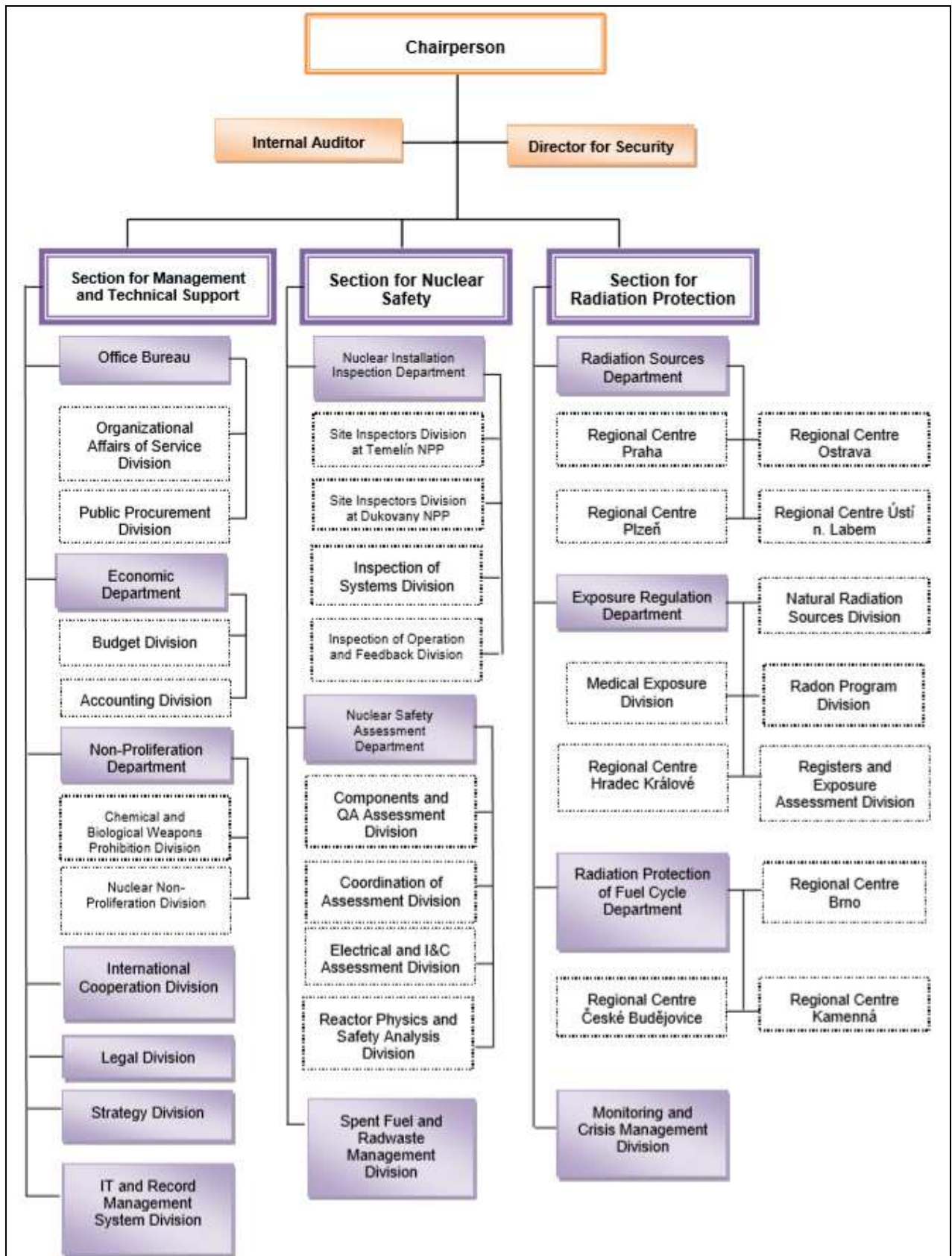


Fig. 5.2 SÚJB organizational structure

The basic principle on which the system of preparation, education and evaluation of SÚJB employees is based on is the continuous improvement of the level and efficiency of the Office's performance.

The specialized employee training programme was organized based on internal guide VDS 039, "System of training and evaluation of SÚJB employees". This guide regulates a system of employees' education which uses and is based on the Job Competence Profiles, Competence Maps, Catalogue of Development Activities and the Credit System as part of the evaluation of employees' training.

The training activities of individual SÚJB employees are determined according to the level of their education, the length and level of their professional experience and the professional specialization. Simultaneously, the strategy and needs of the SÚJB are taken into account, in particular the requirements for a service at a given job post as set out in Job Competence Profile.

The main rule used in the training of SÚJB employees is the systematic way of training implementation and individual approach to each employee, based on the IPDP. IPDP is compiled and annually evaluated by the employee itself, its supervisor and the director of the relevant section. IPDPs are usually compiled for 2 years and they can also include fellowships abroad (eg. Italy, Finland or USA). The aim is to maintain the continuous profile of preparation and continuity of individual training activities. The fulfillment of training activities of individual employees according to IPDP is evaluated based on credits achieved.

The inspectors' training also includes special courses focused on nuclear technologies at the CEZ, a. s. training center in Brno as well as the training on the full-scale simulator of the NPP control system, which significantly improve inspectors' qualification to perform inspection activities. The inspectors also participate in SÚJB internal seminars organized for each significant or stimulating event in terms of SÚJB competence. The content of the seminars is mainly description of occurred events and their root analyses.

In order to train SÚJB inspectors in other areas associated with the performance of their function the Office also used events organized by other training organizations.

5.3.5. Regulatory Body within the Structure of Governmental Bodies

As shown from the below-mentioned Czech legislation and state administration structure, SÚJB has all powers and competence necessary to carry out its mission - to execute the state supervision of nuclear safety, radiation protection, physical protection and radiation extraordinary event management. At the same time, the SÚJB competence does not overlap with or contradict to any other state administration bodies.

5.3.6. Independent Evaluations of the State Supervision

After the amendments to the supervisory and legal framework in the second half of the 1990s and after their full implementation, the Czech Republic approached the IAEA to request independent evaluation of the efforts. This was achieved through two international IRRT missions carried out at SÚJB in March 2000 and in June 2001. Detailed results of these missions are listed in National Report under the Joint Convention, Revision 4.0 of March 2011.

Another independent evaluation of the SÚJB activities was conducted in 2013 in cooperation with IAEA within an IRRS mission. The final report from the IRRS has been also published at the SÚJB website (https://www.sujb.cz/fileadmin/sujb/docs/zpravy/IRRS_Czech_Republic_Final_Report.pdf).

A follow-up IRRS mission was held in May 2017 to evaluate fulfillment of the Action Plan. In their summary at the end of the mission, international experts noted that 16 of the 18 recommendations and 17 of the 18 suggestions made by the IRRS mission in 2013 were taken into account in the Action Plan and can be considered closed. None of the conclusions of IRRS 2013 and the new conclusions of FU IRRS 2017 missions concerned the management of SF and RAW, decommissioning and transport of radioactive and fissile substances.

The final report from the FU IRRS mission was also published on the SÚJB website (https://www.sujb.cz/fileadmin/sujb/docs/aktualne/Mise-IRRS/IRRS_Follow-up_Czech_Republic_Report.pdf).

6. Other General Safety Provisions - Articles 21 - 26 of the Joint Convention

6.1. Responsibility of the Licensee

Article 21 of the Joint Convention:

- 1. Each Contracting Party shall ensure that primary responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant license and shall take the appropriate steps to ensure that the licensee performs its responsibility.*
- 2. If there is no such licensee or other responsible party, the responsibility shall rest with the Contracting Party which has jurisdiction over spent fuel or radioactive waste management.*

Article 5 of the Directive:

- 1. Member States shall establish and maintain a national legislative, regulatory and organizational framework ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:*

f) the allocation of responsibility to the bodies involved in the different steps of spent fuel and radioactive waste management; in particular, the national framework shall give primary responsibility for the spent fuel and radioactive waste to their generators or, under specific circumstances, to a license holder to whom this responsibility has been entrusted by competent bodies;

Article 7 of the Directive:

- 1. Member States shall ensure that the prime responsibility for the safety of spent fuel and radioactive waste management facilities and/or activities rest with the license holder. That responsibility cannot be delegated.*
- 2. Member States shall ensure that the national framework in place require license holders, under the regulatory control of the competent regulatory authority, to regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner. This shall be achieved through an appropriate safety assessment, other arguments and evidence.*

The licensee's responsibility for safe management of SF and RAW is formulated in the Atomic Act which specifies a number of partial responsibilities of the licensee forming the aggregate liability for nuclear safety. Those specific responsibilities are particularly specified in Section (§) 25, Sections (§§) 49 through 55, Sections (§§) 68 and 69, Sections (§§) 111 and 112, Section (§) 150, Sections (§§) 156 through 158, Sections (§§) 163 and 164 of the Atomic Act where the licensee is required, amongst other things, to ensure nuclear safety, radiation protection, security of nuclear installation and to ensure radiation extraordinary event management of its nuclear installations or workplaces that manage radioactive waste. This is followed by additional specific requirements for the nuclear safety system as imposed on the licensee (see National Report under the Joint Convention, Revision 2.3 of September 2005).

One of the fundamental responsibilities of the regulator of nuclear safety is the inspection of fulfillment and observation of the above-mentioned requirements. The rights of inspectors are

specified under Sections (§§) 200 through 203 of the Atomic Act. In agreement with those provisions and in agreement with the Act on inspections No. 255/2012 Coll., the inspectors shall check compliance with the terms and requirements for nuclear safety, radiation protection, physical protection, and radiation extraordinary event management as well as the condition of nuclear installation, or adherence to technical specifications and operating procedures and require evidence that the specified obligations are being fulfilled.

The joint-stock company ČEZ, a. s., the licensee to operate NPP Dukovany and NPP Temelín, SÚRAO, CV Řež and ÚJV Řež, a. s. are charged with the primary responsibility for nuclear safety and radiation protection of their nuclear installations and disposal facilities. This responsibility is delegated to the respective managers at the executive level while the key role in terms of safety is played by directors of those organizations. It shall be the highest priority of the licensee to ensure nuclear safety, radiation protection and radiation extraordinary event management. The entire management system shall be used to maintain the desired level of safety, including the necessary safety controls and feedback to verify the level of safety.

In the area of RAW management the previous Atomic Act No. 18/1997 Coll. entrusted responsibility for final disposal of radioactive waste to the state and ordered the Ministry of Industry and Trade of the Czech Republic to establish a new governmental agency, the Radioactive Waste Repositories Authority (SÚRAO). Pursuant to the Act No. 219/2000 Coll., on property of the Czech Republic and the representation of the Czech Republic in legal relations, as amended, the Authority has been an organizational unit of the state since 1 January 2001. Activities of SÚRAO are funded from the state budget from the so-called nuclear account which is funded by generators of radioactive waste.

The licensee has implemented its own inspection system in order to meet the requirements under the Atomic Act. In compliance with the Quality Assurance Program and the elaborated obligations or delegated responsibility within other documents, the authorized work procedures and the specified dates for periodical testing are subject to supervision. In compliance with the implemented system code, if any event occurs that is related to nuclear safety or radiation protection, the event shall be recorded and investigated and followed by corrective actions to prevent its recurrence. This entire process is evaluated and monitored regularly and systematically by the inspectors performing state supervision.

The major responsibilities of the licensee also include the sole and absolute liability for nuclear damage due to operation of the nuclear installation (see Section (§) 33, paragraph 1 of the Atomic Act).

6.2. Human and Financial Resources

Article 22 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;*
- (ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;*
- (iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.*

Article 7 of the Directive:

5. *Member States shall ensure that the national framework require license holders to provide for and maintain adequate financial and human resources to fulfil their obligations with respect to the safety of spent fuel and radioactive waste management as laid down in paragraphs 1 to 4.*

Article 8 of the Directive:

Member States shall ensure that the national framework require all parties to make arrangements for education and training for their staff, as well as research and development activities to cover the needs of the national programme for spent fuel and radioactive waste management in order to obtain, maintain and to further develop necessary expertise and skills.

The Atomic Act in Section (§) 31 stipulates the following requirements for personnel qualification:

- “(1) Activities of particular relevance to nuclear safety and radiation protection may be performed by a selected worker only on the basis of authorization granted by the Office.*
- (2) The Office shall decide to grant authorization for the performance of activities of particular relevance to nuclear safety or radiation protection at the request of the selected worker if he or she*
- a) has obtained required education, professional experience and training,*
 - b) has appropriate personality characteristics for the activity performed and is medically fit under the act on specific health services, if the activity is of particular relevance to nuclear safety and*
 - c) has successfully passed the examination of special professional competence.”*

Activities particularly important from the viewpoint of nuclear safety and radiation protection, special professional competence and training of persons providing for radiation protection of the registered person are specified in an implementing procedure, i.e. in the Decree No. 409/2016 Coll.

Article 5 of the Directive:

1. *Member States shall establish and maintain a national legislative, regulatory and organizational framework (‘national framework’) for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:*
- (h) the financing scheme(s) for spent fuel and radioactive waste management in accordance with Article 9.*

The obligation of each licensee authorized to operate a nuclear installation or a category III and IV workplace to make steady provision for decommissioning of nuclear installation or category III and IV workplace is declared in Section (§) 54, paragraph 1, letter c) and Section (§) 75, paragraph 2, letter b) of the Atomic Act.

Institutional supervision of disposal facilities containing RAW generated during decommissioning of nuclear installations and workplaces in categories III or IV after their closing will be funded from the nuclear account, to which payments are made in agreement with the Atomic Act by RAW generators in the amounts specified in Title V (Fees for radioactive waste disposal) of the Atomic Act. The nuclear account is a part of state financial assets and liabilities, it is administered by the Ministry of Finance and its purpose is particularly the long-term accumulation of financial means for the development of a deep geological repository for radioactive waste and spent fuel.

Article 9 of the Directive:

Member States shall ensure that the national framework require that adequate financial resources be available when needed for the implementation of national programmes referred to in Article 11, especially for the management of spent fuel and radioactive waste, taking due account of the responsibility of spent fuel and radioactive waste generators.

6.2.1. ČEZ, a. s.

The responsibility for nuclear safety and radiation protection of nuclear installations owned by ČEZ, a. s. rests with the statutory body of this joint-stock company (the Board of Directors) headed by Director General. Director General delegates responsibilities within his/her authority to the Executive Director of the **Nuclear Energy Division** who reports to Director General on the assurance of nuclear safety and radiation protection of the nuclear installations within his/her responsibility.

The process of training and qualifications prescribed for the ČEZ personnel are described in detailed in Chapter 6 of the National Report of the Czech Republic under the Nuclear Safety Convention of September 2001.

Under the law, the joint-stock company ČEZ is obligated to pay specific amounts to the nuclear account in order to make provision for decommissioning of nuclear installations. The payment on the nuclear account is by set by the Atomic Act at CZK 55.00 per each MWh of electricity generated by the nuclear plant. The method used to make provision for decommissioning of nuclear installation is defined in the Decree No. 360/2002 Coll. issued by the Ministry of the Industry and Trade, which determines how to make provisions for decommissioning of nuclear installations or category III and IV workplaces. **This Decree was with effect from 1 July 2020 replaced by new Decree No. 250/2020 Coll., on the method of establishing a reserve for the decommissioning of a nuclear installation and category III and category IV workplace.**

ČEZ, a. s. creates the mandatory provision for decommissioning of NPP Dukovany amounting to 275.264 mil. CZK per year. The provision for decommissioning of NPP Temelín is 225.710 mil. CZK per year. The provision for decommissioning of the Interim Spent Fuel Storage Facility is 0.212 mil. CZK. The provision for decommissioning of the spent nuclear fuel storage facility in Dukovany has been created since 2006, in the amount 0.317 mil. CZK per year. The spent nuclear fuel storage facility in Temelín has been in operation since 2010 and the provision for its decommissioning amounts to 0.290 mil. CZK per year.

The creation of provisions for decommissioning of nuclear installations subject to inspection performed every year by the state organization of SÚRAO in agreement with the Atomic Act.

ČEZ, a. s. has been also creating an accounting provision for storage of spent nuclear fuel. The provision has been created under international accounting standards and it is intended to cover the incurred ČEZ costs associated with the storage of spent nuclear fuel, also after decommissioning of nuclear units.

The power utility ČEZ, a. s.:

- in the accounting period 2019, in agreement with the Atomic Act, deposited to the nuclear account a payment of 1 663.48 mil. CZK and the total amount paid to the nuclear account since 1997 has amounted to 27 339.58 mil. CZK;
- has created a provision for decommissioning of nuclear installations amounting to 10 212.860 mil. CZK (from which the provision for decommissioning of NPP Dukovany is 6 772.948 mil. CZK and for NPP Temelín it amounts to 3 429.666 mil. CZK, for ISFSF Dukovany it amounts to

4.019 mil. CZK, for SFSF Dukovany 3.809 mil. CZK and for SFSF Temelín 2.416 mil. CZK); the blocked funds as of December 31, 2019 amounted to 14 058.004 mil. CZK.

6.2.2. ÚJV Řež, a. s.

The joint-stock company of ÚJV Řež makes provision for decommissioning of the HAW Storage Facility. It has been in operation since 1995. The projected lifetime of the storage is fifty years.

It means that the HAW Storage Facility would be decommissioned in 2047 when its radioactive content (stored RAW or SF) will be removed to a disposal facility – if fulfilling the waste acceptance criteria of existing disposal facilities or planned DGR. If DGR is not available, the requirement for subsequent storage shall be addressed by construction of a new facility or reconstruction of the existing storage facility.

The waste management facilities are part of the decommissioning proposal approved by SÚJB. The cost of decommissioning was verified by SÚRAO. By 31 December, 2019, ÚJV Řež, a. s. created a provision for decommissioning in amount of 104 788 thous. CZK, of which the provision for decommissioning of the HAW Storage Facility is 2 458 thous. CZK.

The SF and RAW management is supported with a sufficient number of qualified personnel. The number of qualified staff is derived from analyses of licensed activities, same as the necessity of meeting the nuclear safety and radiation protection requirements during these activities.

6.2.3. Centrum výzkumu Řež s. r. o.

CV Řež, as the new owner of research reactors LVR-15 and LR-0, also creates a financial provision for their decommissioning. In 2019 CV Řež created an accounting provision for the LVR-15 workplace in the amount of 4 257 000 CZK and for the LR-0 workplace in the amount 335 757 CZK. The new owner transferred the funds in the amount of the reserves created for both facilities to a blocked account. The amount of financial provision created by both the workplaces is reduced by the anticipated share of the state on the financial provision for decommissioning.

CV Řež also makes payments to the nuclear account and the amount has been newly specified in the Atomic Act at 30 CZK per one MWh of thermal energy produced in research reactors.

6.2.4. SÚRAO

SÚJB has approved decommissioning plans, plans for closure of disposal facilities and assessments of decommissioning costs prepared by SÚJB in compliance with Section (§) 53, paragraph 1, letter d) of the Atomic Act.

SÚRAO budget is approved by the Czech Government. In 2018, 7.789 mil. CZK was drawn from the state budget; from both the approved and adjusted budget of 4.700 mil. CZK, whilst 3.132 mil. CZK was drawn from claims from unused expenses. In the same period, a total of 542.5 mil. CZK was drawn from the nuclear account. Of these, current expenditure (including salaries and related expenses) amounted to 271.45 mil. CZK and capital expenditure 271.05 mil. CZK.

Activities associated with SÚRAO competencies are supported with a sufficient number of qualified personnel (the number of positions approved in the budget for 2020 is 61). The staff number is derived from the analyses of licensed activities, as necessary to meet the nuclear safety and radiation protection requirements in the course of such activities.

6.3. Quality Assurance

Article 23 of the Joint Convention:

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programs concerning the safety of spent fuel and radioactive waste management are established and implemented.

Article 7 of the Directive:

4. *Member States shall ensure that the national framework require license holders to establish and implement integrated management systems, including quality assurance, which give due priority for overall management of spent fuel and radioactive waste to safety and are regularly verified by the competent regulatory authority.*

6.3.1. Present State

6.3.1.1. Legal Framework for Quality Assurance

The Atomic Act lays down, within the framework of Sections (§§) 29 and 30, requirements for the establishment and maintenance of a management system for anyone using nuclear energy or carrying out activities in the context of exposure situations, which are regulated by the implementing regulation.

Provisions of Section (§) 29, paragraph 1 stipulates

“With the aim of ensuring and increasing the level of nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management, and security, a management system shall be introduced and maintained by

a) a licensee under

1. *§ 9(1),*
2. *§ 9(2)(a) to (d),*
3. *§ 9(2)(f), Point 7, if they operate a category III workplace,*
4. *§ 9(3) and (4),*
5. *§ 9(6)(a), if they provide training and further training to selected workers performing activities of particular relevance to nuclear safety,*

b) persons designing nuclear installations,

c) persons who design or manufacture selected equipment or modify such equipment,

d) persons who prepare, manage and carry out the construction of structures and technological systems, which are part of a nuclear installation,

e) persons conducting safety assessments under § 48, and

f) persons conducting site evaluation for a nuclear installation under § 47.”

The management system is a set of connected or interacting elements that sets the policies and goals and enables the safe, effective and efficient achievement of these objectives, in particular the achievement of an adequate level of nuclear safety, radiation protection, technical safety, radiation monitoring, managing of radiological extraordinary event and security. All activities shall be managed to achieve this goal.

The implementing regulation is Decree No. 408/2016 Coll., on Requirements for the Management System, which regulates in detail:

- the requirements for the implementation, maintenance and improvement of the management system,
- the content of the management system documentation and the methods of its management,
- the rules for the implementation and management of processes and activities,
- rules for the implementation and management of specific processes,
- the manner of planning in the management system and the scope and manner of interpretation of the such planning documentation,
- the method of making changes to the management system,
- the rules for assessing the effectiveness of the management system, including processes and activities and their changes,
- nonconformity management procedures,
- the way how to ensure the qualification of employees carrying out the processes and activities,
- the scope and manner of ensuring the continued development and regular evaluation of the safety culture and content of the management system program requirements.

According to the Attachment No. 1 of the Atomic Act, the submitted documentation for the licensed activity shall include a management program.

According to the Section (§) 30, paragraph 2 of the Atomic Act:

"... the product or service supplier to a person may only be a person who has a management system in accordance with the requirements of this Act or otherwise that ensures comparability of the quality of processes, activities and their outputs with the requirements of this Act."

The basic requirements for the quality assurance of the selected equipment are defined by the Section (§) 56 of the Atomic Act and are regulated in more detail by the implementing regulation Decree No. 358/2016 Coll., on Requirements for Quality Assurance and Technical Safety and Assessment and Verification of Conformity of Selected Equipment.

6.3.1.2. Quality Assurance Strategy of the Licensee ČEZ, a. s.

The quality assurance of SF and RAW management is provided by ČEZ, a. s. within the following nuclear activities:

- operation of SF storage facilities,
- fuel cycle management,
- RAW management,
- nuclear fuel and nuclear material transportation,
- management of ionizing radiation sources (throughout the entire company),
- personnel training for these activities.

A management system is implemented, maintained and documented at ČEZ, a. s. It takes into account the commitments announced by the Board of Directors of ČEZ, a. s., in the Safety and Environmental Protection Policy.

Strategic points of this policy are:

- Protection of people's life and health having a higher priority than other interests.
- Promotion of the safety and environmental protection as an integral part of the management system.
- Compliance with legislation and public obligations and taking customers into account.

- Constant development of an approach to safety and environmental protection.
- Regular evaluation, prevention and elimination of risks or its reduction to an acceptable level.
- Used technology meets the safety, environmental, economic and technical requirements in the long term.
- Consideration of approach to the safety and the environment, when selecting and evaluating suppliers.
- Open communication of security issues and the impact of activities on society and the environment.
- Provisions of qualified and responsible employees.
- Management of the key knowledge.

In order to ensure processes and activities in the framework of nuclear activities, the Director of the Nuclear Energy Division announced the Nuclear Safety Policy, which takes safety objectives, management system objectives and process and activity management objectives into account to the following extent:

- maintain, evaluate and improve the management system.
- establish an effective management method in each management procedure.
- ensure compliance of the performed activities with legal requirements.
- introduce the measures to ensure and increase the level of safety of NPP operation.
- maintain and further develop the leadership and qualifications of employees.
- develop and evaluate the safety culture.

The management system is designed to ensure that processes and activities in the area of SF and RAW management are carried out in a controlled and organized manner in accordance with the Atomic Act and its implementing decrees, including the requirements of Decree No. 408/2016 Coll., on Management System Requirements, which are applied in a graded approach according to the importance of individual processes and activities from their safety point of view.

The management system is not only in compliance with the legislative requirements (Atomic Act, Decree No. 408/2016 Coll.), but also in line with generally accepted standards (ISO 14001, ISO 27001 and the Safe Enterprise Program) as well as with IAEA specific recommendations. In the case of laboratories and inspection bodies, their management sub-systems are implemented according to the specific requirements of ISO/IEC 17025 and ISO/IEC 17020.

In order to implement, evaluate and continually improve the management system, ČEZ, a. s. has set up a Management System Department, directly subordinated to the Chief Executive Officer, which ensures effective feedback on the management system for strategic management.

Feedback on compliance with safety requirements for strategic management is ensured.

6.3.1.3. Quality Assurance Strategy of SÚRAO

In order to ensure its core, management and supporting processes and activities, SÚRAO has introduced and documented an Integrated Management System that takes into account commitments under the Policy for SÚRAO management system. The Policy applies to items, processes and activities, relations and employees of SÚRAO and through contracts it is also applied to subcontractors supplying products or services affecting safety. The introduced SÚRAO Integrated Management System has been continually maintained and improved. SÚRAO's Integrated Management System has been designed to ensure that the processes and activities and their changes are performed in a controlled and organized manner.

The highest priority of SÚRAO management system is the focus on nuclear safety, radiation protection, technical safety, monitoring of radiation situation, radiation extraordinary event management, security and assurance of quality of related outputs from the processes and activities under the Atomic Act No. 263/2016 Coll. Requirements of ČSN EN ISO 9001 are therefore applied in the Integrated Management System using a graded approach.

The requirements of the Integrated Management System are applied by a graded approach according to the importance of individual processes and activities, therefore by deploying adequate financial and personnel resources according to the risk associated with product failure or misconduct. The main activities are:

- RAW management in three operated RAW disposal facilities,
- operation of nuclear facilities of the RAW disposal facilities Richard and Dukovany,
- operation of cat. IV workplaces in three operated RAW disposal facilities,
- nuclear material management in the RAW disposal facility Richard,
- reconstruction of the cat. IV workplace RAW disposal facility Richard.

6.3.1.4. Strategy of quality assurance in ÚJV Řež, a. s.

The quality management system, as a part of the Integrated Management System implemented in ÚJV Řež, a. s., is based on application of standard series EN ISO 9001, 14001 a 45001 with the objective to assure quality of products and services for clients while following regulatory standards applicable to the performed activities. (in the nuclear area i particularly the Act No. 263/2016 Coll., and other related decrees particularly the Decree No. 408/2016 Coll. and IAEA recommendations). The overall goal of ÚJV Řež, a. s. is expressed in the Integrated Policy of ÚJV Řež, a. s. and in the RAW Management Policy. This Integrated Policy is followed by specific and measurable Objectives of the Integrated Management System of the company annually set up and focused on the professional and effective management and process improvement. In order to ensure quality in the area of relevant activities, management system programmes are developed in the ÚJV Řež, a.s. They describe the management system of the licensee, the processes and activities concerned, including the definition of the responsibilities of the licensee and his suppliers.

6.3.1.5. Quality Assurance Strategy of Centrum výzkumu Řež s. r. o.

CV Řež s. r. o. has implemented and certified an Integrated Quality Management system based on the application of the standards EN ISO 9001:2015, OHSAS 45001:2018 a EMS 14001:2015. The objective of the company is to assure quality of products and services for clients while following regulatory standards applicable to the performed activities. In the field of operation of nuclear installations and workplaces with ionizing radiation sources, CVŘ has elaborated management system programmes and radiation protection programmes describing the licensee's management system, affected processes and activities, including definition of responsibilities for the licensee and its contractors. Related developed procedures provide for the requirements for nuclear safety and radiation protection pursuant the Act No. 263/2016 Coll., as amended, and the Decree No. 408/2016 Coll. They are based on the company's Integrated Management System Policy. Within this system, the quality policy and the quality objectives of the company are defined. Professional and effective process management and improvement is the goal of the company management.

6.3.2. Management System Programs for all Stages of Lifetime of Nuclear Installations

6.3.2.1. Management System Programs in ČEZ, a. s.

To describe the management system of the licensed activities specified in the Atomic Act, the Management System Program document is used. It is also one of the conditions to issue SUJB license to perform the licensed activities.

As it is required by the Atomic Act, the Management System Program is elaborated for licensed activities according to the Section (§) 9, paragraph 1 (a) to (h); § 9, paragraph 2 (a) to (d) and (f) point 2., § 9 paragraph 3 (a) and (b) and § 9 paragraph 4 (a) to (c) of this Act.

The management system programs belong into the category of the documentation not approved by the SÚJB. Their content (i.e. the required elements/requirements including the indication of the activities that are provided by the supplier method) corresponds to the requirements of the Section (§) 16 of Decree No. 408/2016 Coll.

The processing, reviewing, recommending, approving, registering and archiving, including the revision of the documents of the Management System Program type, at ČEZ, a. s., is governed by the document called "Preparation of the Management System Program" except for the Management System Program for Licensed Activities pursuant to the Section (§) 9, Paragraph 1 f) – operation of the nuclear facilities, § 9, para. 2 b) - operation of the cat. III workplace or the cat. IV workplace and § 9, para. 3 a) - radioactive waste management of this Act This programme is described in the "Operational Management System Program" for the licensed activities.

The changes of the Management System Programme are reported to the SÚJB in accordance with the Section (§) 24, paragraph 5 of the Atomic Act.

In accordance with the requirements of the Atomic Act, ČEZ, a. s. has elaborated the Management System Programs for individual stages of the nuclear facility's lifetime except for the decommissioning, which is currently irrelevant.

6.3.2.2. Management System Programs in SÚRAO

The Integrated Management System in SÚRAO is established by a system of management documents. The top-level documents are Management System Policy, Description of Management System and Quality Manual of the Testing Laboratory for casks and radioactive substances in special forms. The related documents are codes, guidelines, methodical instructions and operative management documents.

All operated RAW disposal facilities that perform RAW management of are subject to management system programmes. These programs describe the licensee's management system, affected processes and activities, including definitions of responsibilities of the licensee and its contractors. The management system programmes use the above set of management documents to describe the management system according to Decree No. 408/2016 Coll.

The management documentation for the authorised activity was brought into line with the requirements of the Atomic Act by the end of 2019.

6.3.2.3. Management System Programs in ÚJV Řež, a. s.

ÚJV Řež, a. s. provides for on-site storage of SF (Building 211/8 - HAW Storage Facility) from the research reactors and RAW generated from some other activities. Similarly, it provides for RAW collection, transport, processing and storage. To assure quality of the above-mentioned activities, the company has implemented a quality management system described in the Integrated Management System Manual and related internal regulations within the system of management documents. Activities of the HAW Storage facility are provided for by the Division of Radioactive Waste Management and Decommissioning. Management system of RAW Management Centre is developed in accordance with Decree No. 408/2016 Coll., includes cat. IV. workplace HAW Storage Facility (Build. 211/8) and describes comprehensive measures to ensure safe operation of the storage facility. From the point of view of the fulfilment of the various elements of the quality management system, the emphasis is placed on the application of systematic measures to review, control and improve the efficiency of processes.

6.3.2.4. Management System Programs in Centrum výzkumu Řež s. r. o.

In its objects and from the long-term perspective in the object of ÚJV Řež, a. s. (Building 211/8 - HAW Storage Facility) CV Řež stores spent fuel from research reactors. CV Řež s.r.o. provides for collection and storage of RAW at the place of their generation and hands over the waste to ÚJV Řež, a. s., which provides for its transport, storage, processing, treatment and transport into a disposal facility. For quality assurance of the mentioned activities the company has implemented the quality management system described in the Quality Manual, related process manuals, working instructions and, in the last layer of management documents, also working and management procedures for the individual activities. The fuel cycle, including RAW, is described by management system programmes for the operation of the LVR-15 and LR-0 reactors. From the viewpoint of fulfillment of individual elements of the quality management system the processes and activities are monitored, including their inputs and outputs, to check meeting of requirements for their quality and to demonstrate conformity of their properties with the specified requirements.

6.3.3. Methods of Management System Application and Evaluation of its Efficiency

6.3.3.1. Evaluation of Efficiency of the Management System in ČEZ, a. s.

ČEZ, a. s. has established responsibilities for process quality control and verification at each level (the so-called process owners). The responsibilities for activity and process verification are described in the management documents which form a part of the documented quality management system. The responsibility for implementation of the quality management system rests with all company managers. Each employee is responsible for quality of his/her own work. The persons who perform inspection and surveillance activities are granted a sufficient authority to identify nonconformities and, if necessary, to request appropriate corrective actions. All company employees are entitled to initiate improvements or revisions of the management system.

The effectiveness of the management system is reviewed once a year by the management system department, which is organizationally classified in the CEO's (Chief Executive Officer's) Division. The management system review is carried out according to the IAEA recommendations and its

results are a basis for the evaluation of the efficiency and effectiveness of the management system of ČEZ, a. s.

In addition to the foregoing, ČEZ, a. s. has implemented a system of interconnected elements leading to the monitoring and improvement of the management system according to the Section 8, Section 9 and Section 10 of the Decree No. 408/2016 Coll.

An independent assessment of the established management system effectiveness is performed by the Audit and Compliance Department, which is organizationally included within the Division of CEO, and functionally subordinated to the Audit Committee of ČEZ, a. s.

6.3.3.2. Evaluation of Efficiency of the Management System in SÚRAO

The Management System Policy of SÚRAO is in a controlled manner evaluated on a regular basis every year for its fulfillment and efficiency. Responsibilities and powers for control and verification of processes are described in management documents that are a part of the documented management system. All management staff is responsible for the actual implementation of the management system.

The description of the Management System SÚRAO and individual management system programmes define the scope and method of evaluation of efficiency of the management system, including the processes and activities and their changes, the scope and method of non-conformity control and assurance of continual development and regular evaluation of safety culture. Evaluation of the Integrated Management System of SÚRAO shall be performed internally or by an independent evaluator.

The management system programmes of disposal facilities provide detailed checks of the disposal facility operation system and responsibilities and methods of evaluation of their performance. In the management system programmes it is determined the method of evaluation of their effectiveness, according to the requirements of Decree No. 408/2016 Coll.

6.3.3.3. Evaluation of Efficiency of the Management System in ÚJV Řež, a. s.

To evaluate efficiency of management system programs ÚJV Řež applies control mechanisms, process efficiency assessments and feedback evaluation. For this purpose, particularly the following activities are carried out:

- internal audits to verify the compliance of the integrated management system with the current quality assurance programs,
- validation of managed documentation;
- regular evaluation of vendor;
- determination of control activities in the project design stage (operating activities);
- definition of potential extraordinary events and critical points;
- proposal of control procedures and determination of the process reference parameters;
- corrective actions and their follow-up;
- verification of effectiveness of the adopted measures by the division commissions for safety;
- review of feedback application by the Safety Committee of ÚJV Řež and CV Řež or discussion of serious events by the company management.

Moreover, the company management performs an annual review of the implemented integrated management system as a whole.

6.3.3.4. Evaluation of Efficiency of the Management System in Centrum výzkumu Řež s. r. o.

To evaluate efficiency of its management system CV Řež has defined processes, their owners control mechanisms of the system that evaluates quality of processes and their efficiency, including the feedback system. The evaluation of the management system enables to improve information flows, to verify working activities, responsibilities and powers of persons and to inspect procedures of mutual cooperation. All company managers shall be responsible for proper implementation of the management system. Each employee is then responsible for the fulfillment of binding principles, decrees, norms and guides within its own work. The evaluation focuses on continual monitoring of the achieved quality results, identification of deviations from specified or anticipated requirements, analysis of causes of nonconformities and implementation of corrective actions. Results of the evaluation are primarily used for the improvement of the existing management system. The evaluation of efficiency of quality assurance programs by the management of the organization includes a review of suitability, adequacy and efficiency with regard to the requirements for quality and radiation protection. The management system of CV Řež is reviewed once a year. The output from the review of the quality system is a document containing conclusions of the review.

6.3.4. Current Practices of State Supervision in Quality Assurance

SÚJB controls compliance with the Atomic Act, with the legal regulations issued for its implementation and obligations resulting from international agreements to which the Czech Republic is bound (when it is related to the peaceful use of nuclear energy and ionizing radiation, compliance with decisions issued based on this Act and fulfillment of obligations stipulated by the Act on Metrology in the case of measuring instruments intended or used for measuring ionizing radiation and radioactive substances). Where it is necessary, it extends this action to suppliers of products and services. Inspection activities are focused both on the fulfillment of requirements specified in the management system and on quality assurance of specific selected equipment. Office departments dealing with this activity are primarily the Nuclear Safety Assessment Department, the Spent Fuel and RAW Management Division and the Radiation Protection of the Fuel Cycle Department.

According to the Section (§) 200 of the Atomic Act 'The Office controls:

- a) licensees, registrants and notifiers,
- b) manufacturers, importers and distributors of products, the product type of which has been approved by the Office,
- c) persons performing activities in the peaceful use of nuclear energy and ionizing radiation for which no authorization under this Act is required,
- d) persons involved in the radiation situation monitoring,
- e) the holder of an authorization to carry out particularly important activities for nuclear safety and radiation protection,
- f) authorized and accredited persons carrying out conformity assessment of the selected facility with the technical requirements, and
- g) other persons who are reasonably suspected to violate the obligations provided by this Act or obligations resulting from international agreements to which the Czech Republic is bound if they are related to the peaceful use of nuclear energy and ionizing radiation.

According to the Section 24 of the Atomic Act, the SÚJB assesses the programs of the management system and its changes, which are part of the licensing documentation according to Parts 3 and 4 of the Annex No. 1 of the Atomic Act, for:

- RAW management activities with the exception of the collection, sorting and storage of RAW directly at the RAW producer,
- closure of the RAW disposal facility and
- for the transport of fissile material and for the transport of radioactive material.

Management system programs and their changes assessed by the SÚJB in terms of meeting the requirements of the Decree No. 408/2016 Coll. are an important part of the licensing documentation and are the basic condition for issuing the license for activities established in the Section 9 of the Atomic Act.

Simultaneously, the SÚJB assesses all documentation defined for the given licensed activity as specified in the Sections 3 and 4 of the Annex No. 1 of the Atomic Act.

In the case of a specific selected equipment in the process of type approval, the SÚJB assesses the method of fulfilling the quality assurance requirements at all stages of the selected equipment lifecycle starting with its design, production, assembly, commissioning and operation and assesses the results of the selected equipment quality evaluation, including Declaration of the conformity of the product with the approved type.

In the case of nuclear facilities for the storage and disposal of SF, for storage and disposal of RAW and for the transport of radioactive or fissile material, the SÚJB issues a permit according to the Section 9, paragraph 1 or 2 of the Atomic Act.

6.4. Operational Radiation Protection

Article 24 of Joint Convention:

1. *Each Contracting Party shall take the appropriate steps to ensure that during the operating life of a spent fuel or radioactive waste management facility:*
 - (i) *The radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account*
 - (ii) *No individual shall be exposed in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and*
2. *Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:*
 - (i) *To keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and,*
 - (ii) *So that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.*
3. *Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility:*
 - (i) *Measures are taken to prevent unplanned or uncontrolled release of radioactive materials into the environment; and*
 - (ii) *In the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to*

control the release and mitigate its effects.

6.4.1. Summary of the National Legislation for Radiation Protection

Radiation protection is regulated in the Czech Republic by the Act No. 263/2016 Coll., the Atomic Act, and its implementing legal regulations – the Decree No. 422/2016 Coll., on radiation protection and security of the radionuclide source, and the Decree No. 360/2016 Coll., on monitoring the radiation situation.

Radiation protection legislation is consistent with internationally respected principles of radiation protection based on ICRP recommendations, in particular on the ICRP Publication 103 of 2007. Council Directive 2013/59/Euratom from 5 December 2013 has been transposed into legislation. Legislation is fully consistent with the IAEA safety standards.

6.4.2. Implementation of Radiation Protection Requirements

6.4.2.1. Dose Limits

Irradiation limits are set by the Decree No. 422/2016 Coll. The general limits for public exposure from all allowed or registered activities per calendar year are 1 mSv for the sum of effective doses from external exposure and committed effective doses from internal exposure; 15 mSv for the equivalent dose for the eye lens; and 50 mSv for the average equivalent dose per cm² of the skin regardless of the size of exposed surface.

For exposed workers, it is generally 20 mSv for the sum of effective doses from external exposure and committed effective doses from internal exposure per calendar year. Furthermore, it is 100 mSv for the equivalent dose in the eye lens over any 5 consecutive years and simultaneously 50 mSv per calendar year, 500 mSv for the average equivalent dose per cm² of the skin per calendar year regardless of the size of exposed surface, and 500 mSv per calendar year for the equivalent dose in the upper extremities from the fingers to the forearm and in the lower extremities from the feet to the ankles.

According to the Decree No. 422/2016 Coll. the limits for exposed workers are regarded as not exceeded if quantitative indicators expressed in measurable quantities (referred to as “derived limits”) have not been exceeded. Derived limits for external irradiation are 500 mSv per calendar year for an individual dose equivalent at depth 0.07 mm (Hp (0.07)), 20 mSv per calendar year for the annual individual dose equivalent at a depth of 10 mm (Hp (10)) and 20 mSv per calendar year for the annual individual dose equivalent at a depth of 3 mm (Hp (3)).

The monitoring of human exposure is described in the licensees’ Individual Monitoring Programs. Among other things, the investigation and intervention monitoring levels are determined and activities when they are exceeded are described. Furthermore, the licensee sets the dose optimization limit for the effective dose for the radiation worker. This value is the upper limit of the expected effective doses of radiation workers achieved cumulatively from the beginning of the calendar year.

6.4.2.2. Conditions for Discharge of Radioactive Material

Discharges of radioactive substances from a workplace with a nuclear facility, both into watercourses and into the atmosphere, are a subject to SÚJB authorization according to the Section (§) 9 para. 2 letter e) and the Section (§) 76 of the Atomic Act. Discharges shall be justified

and optimized. In order to optimize the exposure of the population, the Atomic Act determines general dose optimization limits of the dose constraints for the representative person of 0.25 mSv per year and, in the case of power generating nuclear installations, 0.2 mSv for discharges into the air and 0.05 mSv for discharges into the surface waters.

The SÚJB also sets, within the licence for discharge of radioactive substances from the workplace, so-called authorized limits of effective dose of a representative person for each workplace with a nuclear facility. An authorized limit 40 μ Sv per year is set for discharges into the air and 6 μ Sv per year for discharges into surface waters for NPP Dukovany. For NPP Temelin the authorized limit is 40 μ Sv per year for discharges into the atmosphere and 3 μ Sv per year for discharges into surface waters. Authorized limits were established based on the optimization study and calculation of the dispersion of radioactive substances in the environment under conservative conditions using a computer program accredited by the SÚJB. In addition, the responsible water management authority has issued a permit for the discharge of radioactive substances into surface waters for NPP Temelin - the maximum volumetric activity of some radionuclides in discharges is determined.

The discharges are monitored and evaluated by the operator based on a monitoring program approved by SÚJB. An extensive monitoring system is developed by the operator of each nuclear installation for monitoring of the discharges. SÚJB provides its own independent monitoring of discharges from the workplace. Collected samples are handed over for analysis to SÚRO laboratories. As a part of its planned inspections on the fulfillment of the discharge monitoring program, SÚJB compares the results of operator monitoring and independent monitoring results. There are no significant deviations in the results. Results of the measurement provide reliable evidence to the effect that the authorized limits have not been exceeded.

6.4.2.3. Radiation Protection Optimizing

The technical and organizational requirements, guidance levels and procedures to demonstrate the reasonably achievable level of radiation protection are specified under Section (§) 66 of the Atomic Act and in Sections (§§) 7 and 8 of the Decree No. 422/2016 Coll.

The operators of nuclear facility act by the optimization upon the requirements of legal regulations. Before starting a specific activity, they assess and compare options of radiation protection. For this purpose, the SÚJB approved the workplace monitoring program. All exceeding of defined investigation or intervention monitoring levels are investigated and their causes are determined. In the case of non-standard states, the feedback is applied. Information on the results of workplace monitoring, including exceeding of monitoring levels, is submitted to the SÚJB.

At NPP a sophisticated system of room marking contributes to radiation protection - the rooms are categorized according to dose rate, surface contamination or air contamination. Workers protection is carried out following the graded approach principle according to the radiation situation in the affected rooms or workplaces. Before the work starts, the radiation situation is checked in places with expected radiation hot spots. Based on the measurement results the corresponding protective equipment, means and working procedure are determined. If it is necessary, the training is also carried out in order to reduce the working time or to avoid possible issues.

6.4.2.4. Radiation Monitoring in the Surrounding Area of Nuclear Installations

According to the Section (§) 149 of the Atomic Act, the licensee is involved in the monitoring of the radiation situation in the Czech Republic, within the territory at which the nuclear site is located. Obligation to monitor surrounding area of the cat. IV workplace, provided by legal regulations, is performed by the nuclear facility operator according to the monitoring programme of the workplace surrounding area approved by the SÚJB. The monitoring programme determines the scope, frequency and methods of measurement and evaluation of results and monitoring level. The monitoring is carried out by the operator's specialized departments and laboratories, eventually it can be provided by external suppliers.

Monitoring of external irradiation in the vicinity of the NPP is performed by the NPP operator who continuously monitors the dose rate in the local early detection network, so-called teledosimetric system. There are 27 monitors at EDU site, respectively 24 monitors at ETE site which are placed in the inner circuit of the teledosimetric system, around the perimeter of protected area. The outer circuit consists of 24 measuring points in the emergency planning zone of NPP Dukovany, respectively 23 measuring points in the emergency planning zone of NPP Temelín. Data from these monitors are automatically sent to the national monitoring results database MonRaS operated by SÚJB.

For the external exposure monitoring around the NPP site the operator also uses the integral dosimeters - TLDs. Within the local TLD networks, 55 detectors are located in the vicinity of the NPP Dukovany and there are 4 others at the site of the RAW disposal facility Dukovany. In the vicinity of the NPP Temelin there are 42 measuring points with TLDs. TLDs are evaluated quarterly. In addition, the NPP operator provides a mobile monitoring group, which performs not only regular quarterly TLD replacement at the measuring points, but also it monitors dose rates along the specified routes in the emergency planning zone.

Environmental monitoring consists of regular measurements of surface water samples from streams and water reservoirs (ponds), atmospheric fallout, aerosols and iodine from the air, soil and food chain. Regular sampling and measurement of radionuclide activities around the NPPs is performed by the Radiation Control Laboratory of the Environment operated by the NPP operator.

Licensee is obliged to submit the environmental monitoring data to the SÚJB and prepare an annual environmental monitoring report. In addition, the NPP operator issues various information materials to the public on its own initiative. The monitoring results of the surrounding area of both NPPs document the negligible impact of discharges from these workplaces on the environment.

SÚJB independently monitors surrounding areas of workplaces with nuclear installations. In the vicinity of both NPPs SÚJB operates its own local TLD network (a total of 22 measuring points). In each emergency planning zone there are two measuring points for continuous monitoring of dose rate in the early detection network with the on-line measurement data transfer to the MonRaS database. In addition, the SÚJB operates its own monitoring stations. Monitoring within the SÚJB network of environmental and the food chain sampling is completely independent of the NPP operator's monitoring system. Now it is newly governed by the National Monitoring Program, which is effective from 1 January 2019.

Within the planned inspections of monitoring programme of workplace surrounding area the SÚJB compares the operator monitoring and independent monitoring results. There are no significant deviations between them.

6.4.3. Supervision

As stated in the Atomic Act, SÚJB is responsible for state supervision of radiation protection in the Czech Republic. Consequently, SÚJB is authorized to issue regulations to implement the Act and to issue the relevant licenses for ionizing radiation source management and other radiation practices within the exposition situations set forth in the above Act - see Chapter 5.2.2.

The radiation protection is supervised by SÚJB inspectors - there are currently about 60 inspectors at the headquarters in Prague and at eight detached workplaces all over the country referred to as regional centers. The inspector shall prove the necessary expertise and qualifications in the supervised area and he/she have the relevant university degree plus three years of experience. The inspectors are appointed by the SÚJB chairperson - see Chapter 5.3 for more details.

There are three types of inspections performed by the individual inspectors or by a group of inspectors:

- standard (routine) inspections that deal with general obligations and requirements for assurance of radiation protection,
- specialized (topical) inspections that focus on a specific partial area of a licensed activity,
- unplanned (ad hoc) inspections induced by a specific event, on request or based on another instigation.

For the performance and evaluation of supervision activities SÚJB has developed its guidelines, instructions and procedures.

6.5. Radiation Extraordinary Event Management

Article 25 of the Joint Convention:

1. *Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.*
2. *Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.*

6.5.1. Applicable Law

The area of emergency preparedness has been newly regulated as a radiation extraordinary event management and it has been aligned with the crisis management system of the Czech Republic, while the special regulations necessary for radiation extraordinary events have remained in effect.

Management of radiation extraordinary events is defined by the individual stages that represent parts of the process. It is a system of procedures and measures to ensure:

1. analysis and assessment of impacts of potential radiation extraordinary event which means analysis of radiation extraordinary events coming into consideration and assessing their impact,
2. radiation extraordinary event response preparedness, and
3. remedial action after a radiation accident,

while the term “radiation extraordinary event“ means an event that leads or may lead to exceeding of exposure dose limits and requires action to prevent the exceeding of the limits or deterioration of the situation from the standpoint of radiation protection assurance.

6.5.2. Implementation of Measures of Radiation Extraordinary Event Management, including the Role of State Supervision and Other Bodies

6.5.2.1. Classification of Extraordinary Events

The Act No. 263/2016 Coll. establishes that for assessment of severity of radiation extraordinary events which might occur during activities associated with utilization of nuclear energy or while performing activities in exposure situations, the events shall be divided into three basic degrees:

- first degree radiation extraordinary event means a radiation extraordinary event that can be handled by forces and means of the operators or shift personnel of the person whose activities gave rise to the radiation extraordinary event,
- radiation incident means a radiation extraordinary event that cannot be handled by forces and means of the operators or shift personnel of the person whose activities gave rise to the radiation extraordinary event or has resulted from the finding, misuse or loss of a radionuclide source which does not require taking urgent action to protect the general public,
- radiation accident means a radiation extraordinary event that cannot be handled by forces and means of the operators or shift personnel of the person whose activities gave rise to the radiation extraordinary event or has resulted from the finding, misuse or loss of a radionuclide source which requires taking urgent action to protect the general public.

6.5.2.2. National Systems of Crisis Preparedness and Response

In accordance with the legislation, especially with regard to area of crisis management, in the Czech Republic there is specified structure of crisis preparedness scheme in the event of various kinds of crisis situation occurrence. In the Fig. 6.1 is shown a basic diagram of the structure of crisis preparedness system.

The Government of the Czech Republic is the highest body responsible for the extraordinary events preparedness and, when they occur, for the response on the territory of the country. The National Security Council, as a permanent governmental working body responsible for the coordination of security matters in the Czech Republic and the preparation of draft measures to ensure it, was established by the Constitutional Act No. 110/1998 Coll., on the security of the Czech Republic, as amended. The composition and activities of the NSC are further specified by the Resolution of the Government of the Czech Republic from 9 July 2014 No. 544 (on the Statute of the National Security Council and on the Statutes of the Standing Working Committees of the National Security Council), further by the Government Resolution No. 360 from 10 May 2017 (on the proposal to establish the Committee for Cyber Security of the National Security Council), by

the Government Resolution No. 247 from 18 April 2018 (on the proposal for amendments to the Statutes of the National Security Council and its standing working committees), also by the Government Resolution No. 457 from 10 July 2018 (on the proposal for amendments to the Statutes of the National Security Council and its standing working committees) and by the Government Resolution No. 692 from 24 October 2018 (on the proposal for amendments to the Statutes of the National Security Council and its standing working committees). By Resolution of the Government of the Czech Republic from 9 July 2014 No. 544 (on the Statute of the National Security Council and on the Statutes of the Standing Working Committees of the National Security Council) its main tasks in the area of crisis preparedness and crisis management were set down. In its activities, the NSC is governed by the Statute and by the Rules of Procedure.

The Civil Emergency Planning Committee is the permanent working body of the NSC in the area of civil emergency planning and coordination and arrangements planning to ensure the protection of the internal security of the state. The Committee coordinates this area with a focus on planning arrangements to ensure the protection of the population and economy. It also plans arrangements to ensure the protection of critical infrastructure, including measures in the case of a radiation accident, preventive measures against the use of mass destruction weapons, including solutions to eliminate the consequences of their use and harmonization of requirements for material resources that are necessary to ensure the security of the Czech Republic.

During 2015, a strategic material called Threat Analysis for the Czech Republic was prepared and on 27. April 2016 approved by the Resolution No. 369 of the Government of the Czech Republic. On the basis of the results of this Analysis, the risk of a radiation accident is still considered as a possible crisis situation. Arrangements to eliminate the risk occurrence and to reduce potential impacts, including updating the relevant safety documentation, remain in force. Following the identification of crisis situations in the Threat Analysis, standard plans for their resolution have been updated, including a standard plan for a radiation accident. The new standard plan for the radiation accident was approved by the Chairman of the SÚJB in September 2018.

The tasks in planning and preparedness for a radiation accident fall in the competence of the Committee for Civil and Emergency Planning and the tasks in management of radiation accidents fall in the competence of the Central Crisis Staff, a working body of the government to deal with crisis situations.

The main tasks of the Committee for Civil and Emergency Planning are defined by Statute of the Committee and they are focused mainly on:

- coordinating of the measures planning to ensure protection of the population and the economy, protection of critical infrastructure, including the measures in the case of a radiation accident,
- taking precautions against the use of weapons of mass destruction, including solutions to eliminate the consequences of their use and harmonization of requirements for material resources that are necessary to ensure the security of the Czech Republic,
- review and discussing the plans of preparatory, planning and conceptual measures and activities,
- ensuring of operative interdepartmental coordination of preparatory, planning and conceptual measures and activities,
- evaluation of the implementation of preparatory, planning and conceptual measures and activities and drawing up the proposals for taking the necessary precautions,

- assessment, discussion and coordination of the activities of the Czech Republic representatives in the institutions of the European Union, NATO and other international entities,
- discussing the Plan of Creation and Maintenance of State Material Reserves to ensure security of the Czech Republic,
- coordination of the security research in the Czech Republic.

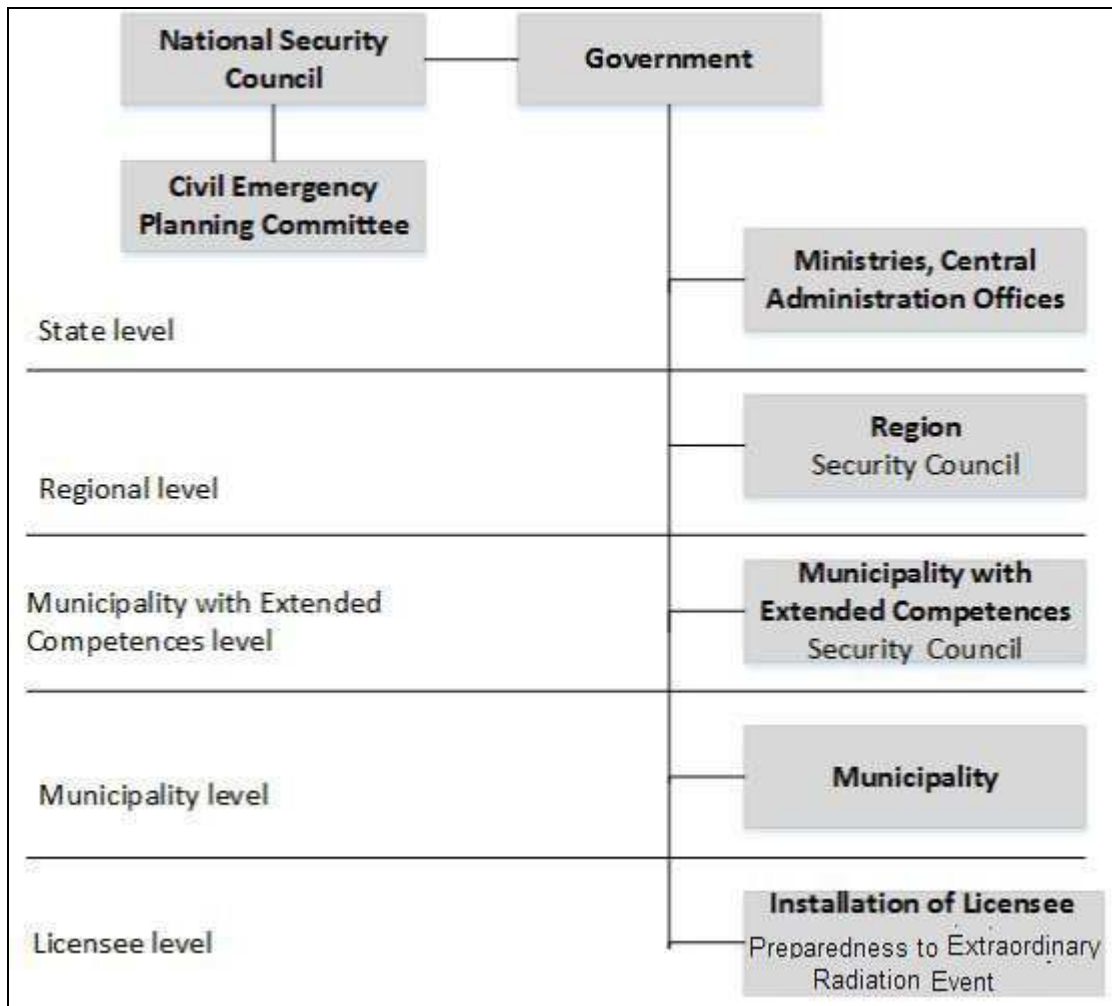


Fig. 6.1 Basic structure of crisis preparedness for extraordinary events in the Czech Republic

The chairperson of the Committee for Civil and Emergency Planning is the Minister of the Interior, the executive Chairman is the Deputy Minister of the Interior and the other members of the Committee are deputy ministers of 12 departments, Chairperson of the SÚJB, a member of the Board of the Czech National Bank, Chairman of the State Material Reserves Administration, Director of the National Security Agency, Director of the National Cyber and Information Security Agency, Director of the National Security Council Secretariat, Chairman of the Czech Telecommunication Office Council, Chief of Police, Director General of Fire Rescue Service and a representative of the President's Office.

For the national response on crisis situations, incl. radiation accidents, a Central Crisis Staff, which is a working body of the Czech government, has been established. The Chairman of the Staff is appointed by the Prime Minister and depending on the nature of the crisis situation it is one of the members of the Government or members of the Central Crisis Staff.

Central Crisis Staff can also be activated in the case of a radiation accidents of a nuclear installation outside the Czech territory, which may have impact on the Czech Republic territory and in the case of a radiation accident occurring during the transport of nuclear materials and radioactive substances.

The role of the Czech government, central administrative bodies and other state authorities in the radiation extraordinary event management is specified in Sections (§§) 210 to 225 of the Atomic Act. According to these sections was established as follows:

- The Czech government approves the national radiation extraordinary event plan.
- The Ministries and other administrative authorities forward to the Office and to the Ministry of the Interior support documents for drawing up or updating the national radiation extraordinary event plan and, after it has been approved, conduct exercises and act in compliance with the plan.
- The Ministry of the Interior cooperate with the Office in drawing up the national radiation extraordinary event plan.
- The Ministry of Health creates a system for the provision of special medical assistance to natural persons exposed to radiation in radiation extraordinary events by selected clinical workplaces.
- On radiation situation monitoring and monitoring on monitoring routes and sites participates the Ministry of Defense, the Ministry of Agriculture, the Ministry of the Environment, the Police of the Czech Republic, the Customs Administration of the Czech Republic, the Czech Agriculture and Food Inspection Authority and the Fire Rescue Service of the Czech Republic.
- The Fire Rescue Service of the Czech Republic, within the scope of its competence defined in other legislation for the case of a radiation accident, provides preliminary information to the affected general public about the applicable measures for the protection of the general public and the steps that need to be taken if such a situation occurs. In the case of a radiation incident or radiation accident, immediately provides information, within the scope of its competence defined in other legislation, to the general public affected by this radiation extraordinary event. It draws up off-site emergency plans for the specified emergency planning zone around the nuclear installation. The Fire Rescue Service cooperates with the licensee and the competent regional office in the provision of iodine prophylaxis antidotes to the general public in the emergency planning zone.
- Respective Regional Office provides preliminary information, within the scope of its competence defined in other legislation, to the general public in the emergency planning zone about the applicable measures for the protection of the general public and the steps that need to be taken if such a situation occurs. The Regional Office cooperates with licensees and the Fire Rescue Service of the Czech Republic to provide the general public in the emergency planning zone with iodine prophylaxis antidotes.
- The president of the region in the case of a radiation incident involving a suspected release of radioactive substances or ionising radiation outside the nuclear installation grounds or the premises of a workplace using sources of ionising radiation, or in the case of a radiation accident within the territory of the region, immediately provide information, within the scope of its competence defined in other legislation, to the general public affected by this radiation extraordinary event about the facts of the radiation incident or radiation accident,

the steps to be taken and where necessary, measures for the protection of the general public to be adopted. When informing the public cooperates with the Fire Rescue Service of the Czech Republic and municipal offices of municipalities with extended authorities. Approves off-site emergency plans for the emergency planning zone.

- The Ministry of Agriculture ensures the operation of the measurement laboratory and its participation in comparative measurements.
- The Ministry of the Environment performs observation and forecasts of the development of the meteorological situation and distribution of released radionuclides as part of accidental monitoring, and ensure the operation of the measurement laboratory and its participation in comparative measurements.

In the case of a crisis situation – radiation accidents at the Czech territory or abroad with a possible impact on the Czech Republic territory – the crisis is handled within system of crisis response, which basic scheme is shown in Fig. 6.2.

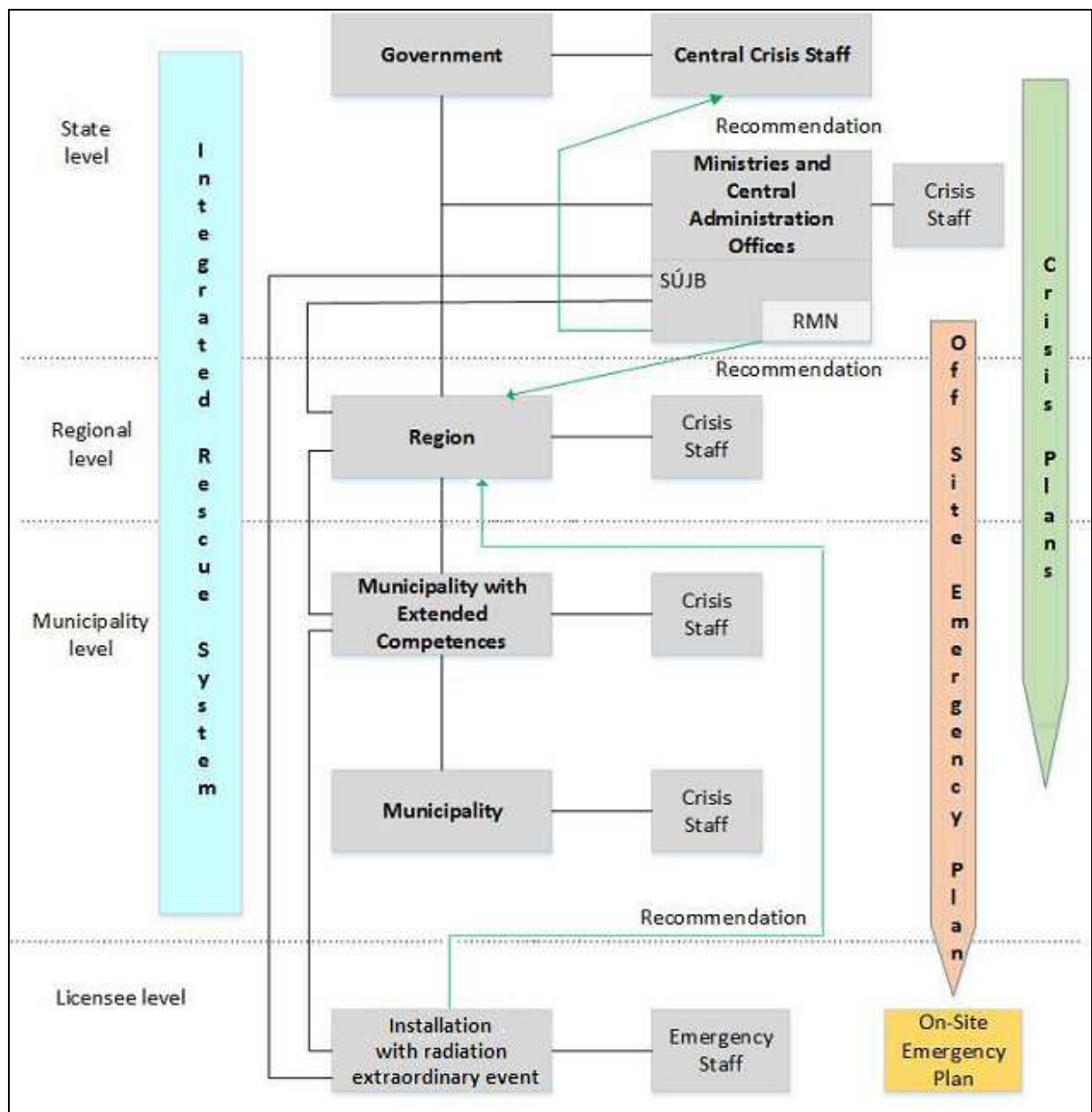


Fig. 6.2 Basic structure of crisis response to radiation accidents in the Czech Republic

6.5.2.3. On-site Emergency Plans for Nuclear Installations or Workplaces with Radiation Activities - SF or RAW Management

Nuclear installations and workplaces where activities in exposure situations are performed, i.e. also SF or RAW management activities, shall prepare on-site emergency plans, as well as intervention instructions in compliance with the Act No. 263/2016 Coll.; the content of the plans is specified in the SÚJB Decree No. 359/2016 Coll. This obligation shall also apply to:

- RAW disposal facilities and RAW storage facilities classified in the SÚJB Decree No. 422/2016 Coll. as category IV workplaces, and
- workplaces where activities in exposure situations are performed, including management of RAW and SF, classified as workplaces in categories IV and III under the Decree No. 422/2016 Coll.

Documentation of radiation extraordinary event management in the scope described above shall be prepared by each of the following licensees:

- ČEZ, a. s. – NPP Dukovany (NI),
– NPP Temelín (NI),
- SÚRAO – RAW disposal facility Dukovany (NI),
– RAW disposal facility Richard (NI),
– RAW disposal facility Bratrství,
- ÚJV Řež, a. s. (NI),
- ÚJP Praha, a. s.,
- VF, a. s.,
- ISOTREND s. r. o. Praha,
- ZAM-SERVIS s. r. o. Ostrava.

The licensees for operation of nuclear installation have developed their on-site emergency plans that also include radiation extraordinary event management in RAW management. In the case of NPPs the on-site emergency plans also include management of spent fuel in the ISFSF and SFSF in Dukovany and the SFSF in Temelín.

The on-site emergency plans, or any amendments thereof, are subject to SÚJB approval. SÚJB supervises assurance of radiation extraordinary event management by the individual licensees.

6.5.2.4. Off-site Emergency Plans

For the nuclear installations mentioned above analyses were performed to check the possibility of radiation accidents and their consequences to the population and impact on the environment. The analyses were presented to SÚJB for evaluation. Emergency planning zones for NPP Dukovany and NPP Temelín were established by SÚJB decisions based on the submitted proposals, on the grounds of assessment of stipulated extraordinary events and their consequences from the viewpoint of technologies of nuclear installations for power generation. Emergency planning zones established for nuclear installations by SÚJB before the effective date of the Act No. 263/2016 Coll. shall be considered emergency planning zones under the new Act.

Based on the review of analyses submitted for the affected workplaces with RAW or SF management and based on the assessment of stipulated extraordinary events and their consequences from RAW and SF management SÚJB established no additional emergency planning zones, while in the case of the RAW disposal facility Dukovany SÚJB considered the existing emergency planning zone.

For NPP Dukovany and NPP Temelín emergency planning zones the off-site emergency plans (in compliance with the Act No. 239/2000 Coll. and Decree No. 328/2001 Coll.) were prepared by the relevant regional fire and rescue services in cooperation with municipalities with extended competences offices the territories of which are included in emergency planning zones.

6.5.2.5. SÚJB Activities in the case of Radiation Extraordinary Event

In agreement with provisions of the Act No. 263/2016 Coll., SÚJB performs the following:

- manages and performs radiation situation monitoring on the territory of the Czech Republic,
- ensures and conducts drills and emergency exercises for radiation extraordinary event response,
- in cooperation with the Ministry of Interior draws up the national radiation emergency plan,
- provides preliminary information to the general public for the event of a radiation accident about protective measures and about the steps to be taken to ensure radiation protection,
- based on results of the performed radiation situation monitoring it proposes urgent protective measures or subsequent protective measures or their specification or recall and confirms or specifies proposals for introduction of urgent protective measures issued by the licensee,
- provides information of the general public about the occurrence and the course of a radiation accident with an impact on the territory of the Czech Republic outside an emergency planning zone and about the steps and measures to be taken during the various development stages of the radiation accident, unless the information is provided by another state administration body,
- is involved, in the scope of its responsibilities, in provision of information about the occurrence and development of a radiation accident in an emergency planning zone,
- provides for information to the respective regulatory authorities in the neighboring Euratom member states about the occurrence and development of a radiation accident with an impact on the territory of the Czech Republic and about the steps and measures to be taken during the various stages of development of the radiation extraordinary event,
- ensure that an international peer review is invited immediately in the case of a radiation accident that has occurred in the territory of the Czech Republic and led to the implementation of protective measures outside a nuclear installation grounds,
- provide information about the adoption of measures to protect the general public in the Czech Republic in the event of a radiation accident arisen in the territory of Member States of the Euratom to the European Commission and other Member States of the Euratom which may be affected by these measures and, in accordance with the Czech Republic's international commitments, provide public access to information thus obtained,
- ensure notification of regional authorities about the occurrence and the course of a radiation accident outside the territory of the Czech Republic and about the steps and measures to be taken in the course of the radiation extraordinary event.

In agreement with provisions of Section (§) 9, paragraph (2) of the Crisis Act, SÚJB establishes crisis management workplace and provides for activities of the SÚJB Crisis Staff. The SÚJB Crisis Staff also serves as a contact point for continual receiving and communication of information about occurrence of radiation extraordinary events.

In the case of a radiation extraordinary event the Crisis Staff of SÚJB shall focus on the following:

- evaluation and forecast of the development of technology condition in conjunction with the measures implemented by operators of the nuclear installation, including determination of the source term, based on the data and information provided from the nuclear installation and

- using the technical equipment and methodology or program tools,
- evaluation of the radiation situation at the nuclear installation based on the provided data and information and using the technical equipment and methodology or program tools,
 - co-operation with the Czech Hydrometeorological Institute to forecast release of radioactive materials from a place of occurrence of a radiation extraordinary event and to process information about potential off-site exposure based on the weather situation and its predicted progress, including specification and clarification of the radiation situation based on the information on radioactive release from the nuclear installation,
 - specification of the source term of radioactive release and the range of affected area based on the data and information gathered by radiation situation monitoring,
 - development of input documents for a proposal of introduction of urgent protective measures or subsequent protective measures or their specification or recall and also development of input documents that confirm or specify a proposal for introduction of urgent protective measures issued by the licensee,
 - development of information and reports about occurrence and evolution of a radiation accident having an impact on the territory of the Czech Republic outside the emergency planning zone and about the steps and responses to be taken during individual stages of the radiation extraordinary event development,
 - provision of information about adopted measures to protect the population in the Czech Republic in the case of a radiation accident that occurred on the territory of Euratom member states, to the European Commission and to other Euratom member states that can be affected by such measures and, in agreement with international commitments of the Czech Republic, dissemination of such information to the public.

6.5.2.6. Training and Drills

Each licensee shall regularly check radiation extraordinary event response preparedness by means of drills, emergency exercises and verification of functionality of technical means under the on-site emergency plan and intervention instructions; the checking of radiation extraordinary event response preparedness must be performed based on an annual plan and evaluated.

Each licensee for activities relating to utilization of nuclear energy and performance of activities in exposure situations, for which an emergency planning zone has been established, shall, among other things, verify by means of exercises and tactical exercises, in cooperation with the competent public administration authorities and integrated rescue system units, efficiency and mutual consistency between the on-site emergency plan and the off-site emergency plan.

Drills and emergency exercises must be performed in agreement with a developed annual plan for verification of radiation extraordinary event response preparedness which identifies the focus and scope of the training or emergency exercises and their scheduled dates.

Verification of efficiency of and mutual consistency between the on-site emergency plan and off-site emergency plan must be conducted by joint exercise of a radiation accident scenario occurring at a nuclear installation or workplace in category IV with an established emergency planning zone, once in 4 calendar years and by evaluation of such an exercise..

Assurance of radiation extraordinary event management in an emergency planning zone is verified by exercises under an off-site emergency plan in the case of a radiation accident. The exercise is prepared by the regional office in cooperation with the licensee. The parties involved in the exercise are the licensee, the regional office, units of the integrated rescue service (Fire

Rescue Service of the Czech Republic, fire protection units covering the region, providers of medical first-aid services and Police of the Czech Republic) and other authorities and organizations involved in the off-site emergency plan and SÚJB.

The Czech Republic takes part in the international exercises organized by EC (ECURIE), IAEA (CONVEX), NEA OECD (INEX), NATO (CMX) and others.

6.5.2.7. Supervision by SÚJB

SÚJB supervises the status of radiation extraordinary event management by the licensees in compliance with the Act No. 263/2016 Coll., as amended, and the Act No. 255/2012 Coll., Control Code. The supervision in this area is focused on:

- status of assurance of education and professional training for radiation extraordinary event response preparedness,
- review of procedures and measures to ensure detection of occurrence of radiation extraordinary event,
- review of procedures and measures to ensure announcement of radiation extraordinary event and notification to affected authorities,
- review of procedures and measures to ensure radiation extraordinary event response,
- review of procedures and measures to ensure limitation of emergency exposure,
- review of procedures and measures to ensure verification of preparedness of persons to respond,
- review of procedures and measures to ensure documentation of radiation extraordinary event response,
- performance and documentation of verification of function of technical means,
- up-to-date status of on-site emergency plans approved by SÚJB,
- developed intervention instructions in place, their mutual links and relationship to the intervention procedures stipulated in the on-site emergency plans,
- fulfillment of the annual plan to certify radiation extraordinary event response preparedness,
- contracting of other persons necessary to implement the response to a radiation incident or a radiation accident, as indicated in the on-site emergency plan.

In addition to this part of supervision, SÚJB is also responsible for supervision of emergency exercises with scenarios simulating extraordinary event occurrence and development and for management and intervention activities under the on-site emergency plan and the associated intervention instructions.

6.6. Decommissioning

Article 26 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

- (i) qualified staff and adequate financial resources are available;*
- (ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;*
- (iii) the provisions of Article 25 with respect to emergency preparedness are applied; and*
- (iv) records of Information important to decommissioning are kept.*

6.6.1. Summary of National Decommissioning legislation

Decommissioning of nuclear installations in the Czech Republic is regulated by the Atomic Act and its implementing Decree issued by SÚJB No. 377/2016 Coll., on requirements for safe management of radioactive waste and decommissioning of nuclear installations or workplaces of cat. III or IV (categorization of workplaces, on which the radiation activities are performed, is based on category of ionization radiation sources that are managed at the workplaces).

With reference to the Atomic Act, decommissioning of nuclear installations is one of the activities associated with utilization of nuclear power while decommissioning of workplaces of category III and IV is one of the activities within exposure situations. Atomic Act defines decommissioning as the activities aimed at putting a nuclear installation or a workplace in category III or IV into a condition allowing:

- its use for a different purpose or for different use of the territory on which it was situated, without any limitations, or
- its use, with a limitation, for other activities relating to utilization of nuclear energy or activities in exposure situations.

For activities relating to utilization of nuclear power the Atomic Act sets forth in Title Two prerequisites with respect to the activities associated with utilization of nuclear power. In Section (§) 9, the prerequisite means a license issued to an applicant by SÚJB within its competence defined under Section (§) 208 thereof. As stated in Section (§) 208, SÚJB shall approve the documentation required under this Act for the given license application. The license shall be issued for each decommissioning stage of the nuclear installation within the meaning of the provisions under Section (§) 9, paragraph 1, letter g) of the Atomic Act, in the scope and manner set forth in the implementing regulation (the SÚJB Decree No. 377/2016 Coll.).

The preparation for decommissioning shall be included in each stage of a nuclear installation lifecycle. The siting license documentation for a nuclear installation shall include a draft concept for safe decommissioning within the Initial Safety Report. The building license documentation for a nuclear installation shall in the Initial Safety Report include a concept for safe decommissioning of the installation or workplace being licensed, including RAW disposal. The licensing documentation for each commissioning stage of a nuclear installation without a reactor shall also include a decommissioning plan approved by the Office, as well as the estimated cost of decommissioning verified by SÚRAO. The licensing documentation for operation of a nuclear installation shall include a decommissioning plan approved by the Office, as well as the estimated cost of decommissioning verified by SÚRAO. The scope and method of decommissioning and completion of decommissioning are specified in the SÚJB Decree No. 377/2016 Coll. The transitional period from the end of energy operation of NPP until the issue of a decommissioning license for various stages of decommissioning is considered to be a part of NIs operation.

The applicant for a decommissioning license shall submit the requested documents which shall include, pursuant to Annex No. 1 to the Atomic Act, Part 1, letter g), also a proposal of organizational preparation and personnel provision of nuclear installation decommissioning, analysis and evaluation of radiation extraordinary events, monitoring program, on-site emergency plan and regulation of the emergency planning zone. Other details:

- of the decommissioning concept and plan are provided in the Decree No. 377/2016, in Section (§) 13, and

- of the list of documentation for licenses of individual decommissioning stages of nuclear installations

are provided in Annex No. 1 to the Atomic Act.

Further details on the legislative requirements for decommissioning of nuclear installations are mentioned in the National Report to the Joint Convention, Revision 6.0, April, 2017.

6.6.2. Regulation

A license for each decommissioning stage of a nuclear installation and an approval of the required documentation using the appropriate administration procedures as per Section (§) 9, paragraph 1, letter g) of the Atomic Act, shall be preceded by on-site supervision. Prior to approval of decommissioning plan the supervision shall be related to the approval process for each commissioning stage of the nuclear installation.

The decommissioning of nuclear installations is supervised by SÚJB inspectors. There are 2 inspectors assigned to this task at the headquarters in Prague. Based on the supervision needs (radiation control or nuclear safety) other SÚJB inspectors may be involved.

6.7. Transparency

Article 5 of the Directive:

1. *Member States shall establish and maintain a national legislative, regulatory and organizational framework ('national framework') for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for all of the following:*

g) national requirements for public information and participation;

Article 10 of the Directive:

1. *Member States shall ensure that necessary information on the management of spent fuel and radioactive waste be made available to workers and the general public. This obligation includes ensuring that the competent regulatory authority informs the public in the fields of its competence. Information shall be made available to the public in accordance with national legislation and international obligations, provided that this does not jeopardize other interests such as, inter alia, security, recognized in national legislation or international obligations.*

2. *Member States shall ensure that the public be given the necessary opportunities to participate effectively in the decision-making process regarding spent fuel and radioactive waste management in accordance with national legislation and international obligations.*

The right of free access to information in the Czech Republic is regulated by the Act No. 106/1999 Coll. The act establishes rules for provision of information and conditions for the right to free access to information in agreement with the applicable Directive of the European Parliament and of the Council (2003/98/EC, on the re-use of public sector information). The right to information about the environment is regulated by the Act No. 123/1998 Coll., in agreement with the Directive of the European Parliament and of the Council 2003/4/EC, on public access to environmental information. It regulates the assurance of right to environmental information and the right to timely and complete environmental information, to creation of conditions for execution of the right and support of pro-active disclosure of environmental information by the

liable entities. Every year SÚJB receives several inquiries concerning management of SF and RAW with reference to the above-mentioned legal regulations. The questions asked by the general public and the respective answers are made public on the SÚJB website, along with frequently asked questions and Internet conferences on selected spheres of SÚJB activities.

The obligation to inform the general public about management of RAW is imposed on SÚJB directly also in Section (§) 208, letter o) of the Act No. 263/2016 Coll. The information shall include the quantity of generated RAW, the quantity of RAW stored in the existing disposal facilities and the number RAW transports (both within the country and international) performed in one calendar year. The information is made public once a year at the SÚJB website. The information publically available at the SÚJB website also includes all the National Reports, including questions asked by the Contracting Parties and the respective answers.

The general public is involved in the decision-making process concerning management of RAW and SF during the assessment of environmental impacts of installations for SF and RAW management (EIA) under the Act No. 17/1992 Coll., on the environment, as amended by the Acts No. 123/1998 Coll. and No. 100/2001 Coll., and by the Act No. 93/2004 Coll., on assessment of impacts of development concepts and programs on the environment. The environmental impact assessment issued by MŽP, which is responsible for implementation of the EIA process, is, among other things, always requested for planned projects of “installations designed for processing of spent or irradiated fuel or high-level radioactive waste” and “installations designed for final deposition, final disposal or long-term storage planned for more than 10 years of spent or irradiated nuclear fuel and also for radioactive waste at a different place than where they were generated“. The general public shall be also involved in the decision-making process under the Act No. 183/2006 Coll. (Building Act).

SÚJB also attends meetings with the general public and RAW and SF management licensees, particularly in connection with public discussions to select locations for the DGR. Twice a year SÚJB representatives together with licensees attend workshops on RAW management.

In mid-November 2019, the Advisory Panel of Experts (MPO, MŽP, SÚRAO, SÚRO, ČVUT, MUNI and nominee of site representatives), which is the advisory body of the Director of SÚRAO, has launched his work to guarantee the professional level, objectivity, openness and transparency of the site reduction process, including the evaluation and analysis of the outputs from this process. Representatives of the SÚJB, Institute of Sociology of the Czech Academy of Sciences and affected sites participated at the activities of the Advisory Panel work as observers. The Advisory Panel ended its work in June 2020 and selected four of originaly nine considered sites for next phases of DGR development.

7. Safe Management of Spent Fuel - Articles 4 - 10 of the Joint Convention

7.1. General Safety Requirements

Article 4 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

In doing so, each Contracting Party shall take the appropriate steps to:

- (i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;*
- (ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;*
- (iii) take into account interdependencies among the different steps in spent fuel management;*
- (iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;*
- (v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;*
- (vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;*
- (vii) aim to avoid imposing undue burdens on future generations.*

The general safety requirements are incorporated in the supreme law, i.e. in the Atomic Act of the Czech Republic. Part two of the Act regulates general conditions for the execution of activities associated with utilization of nuclear power. Section (§) 5, paragraph 2 of the Act clearly stipulates that: *"Anyone who uses nuclear energy, manages a nuclear item or performs activities in exposure situations shall*

- a) as a matter of priority, ensure nuclear safety, safety of nuclear items and radiation protection, while respecting the present level of science and technology and good practice,"*

This principle is then reflected in all implementing regulations associated with the Atomic Act in the Czech legislation to detail the fundamental requirements contained therein. Decrees are generally binding regulations and therefore their observation is mandatory for any person who performs or provides support for activities related to utilization of nuclear power, i.e. designers, manufacturers or operators, as well as the regulatory bodies.

Basic safety requirements for commissioning and operation of every nuclear installation are provided in Sections (§§) 52 – 54 of the Atomic Act and in Sections (§§) 15 – 23 of the Decree No. 21/2017 Coll., on assurance of nuclear safety of nuclear installations.

Regulatory requirements for subcriticality and heat removal in SF management are detailed in Sections (§§) 13 to 15 of the Decree No. 329/2017 Coll., on Requirements for Design of a Nuclear Installation.

RAW generated from SF management shall be minimized by the actual storage technology. In both NPPs the residual contamination from cask surface decontamination prior to transportation from HVB to SF storage facilities is the only potential source of liquid and solid RAW. Residual contamination may only be released from cask surface during periodical cask treatment in SF storage facilities where radionuclides may be carried over into cleaning solutions, detergents or personal protective equipment.

In the case that SF is declared as RAW by the generator or by SÚJB and subsequently disposed in DGR, this activity shall be also regulated by the legislation relating to RAW in underground (currently the Act No. 44/1988 Coll. and the Act No. 61/1988 Coll., as amended).

The links between individual stages of SF management were already considered in the Policy (see Chapter 2.2) whereas all key stages of SF management are defined in the Atomic Act and its implementing regulations. The current activities cover all stages of SF management up to its storage. SÚRAO was established in 1998 as the state organization responsible for activities associated with RAW storage, including activities related to SF treatment into a form suitable for disposal and activities associated with the preparation, construction, commissioning, operation and decommissioning of storage systems.

In the Czech Republic, the protection of individuals, the society and the environment against radiological hazards due to SF management is mainly established in the Atomic Act and in the Decree No. 422/2016 Coll., on radiation protection and security of radionuclide sources. In compliance with international recommendations and according to the European Community law, the Decree stipulates requirements for assurance of radiation protection in exposure situations.

Any potential environmental impacts, including biological or chemical hazards, possibly related to SF management, shall also be reviewed and evaluated as stipulated by the Act No. 100/2001 Coll., on assessment of impacts on the environment. Annex 1 to the Act No. 100/2001 Coll. classifies “*The facilities intended for processing of spent or irradiated nuclear fuel or highly active radioactive waste*” in the Category I, Number 3.4 (plans subject to mandatory review).

Any activities performed to manage SF shall be aimed to minimize the burden incurred to the future generations due to such activities. These efforts are also conveyed as one of the fundamental principles of the Policy. As some activities will have to be continued even in the distant future, such as development, construction and operation of DGR, the prerequisites for such activities have been already ensured for their successful continuation. That means primarily the financial and institutional provision of such activities regulated under the Czech law.

7.2. Existing Facilities

Article 5 of the Joint Convention:

Each Contracting Party shall in due course take the appropriate steps to review the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

7.2.1. Nuclear Power Plant Dukovany

Spent fuel is generated at the NPP Dukovany site from four VVER 440/213 reactor units. After the upgrade completed in 2013 the power of each of four reactor units has been increased to 510 MWe. The light-water reactors are operated in refueling cycles. Once a year, each reactor unit

is shut down for planned refueling and equipment review. During each refueling, a part of VVER 440 spent FAs, that have worked the required number of cycles, is removed from the core to the adjacent SF pool located in the reactor hall (each reactor has its own SF pool). The annual generation of SF per reactor unit is approximately 9 t. SF is then stored in SF pools at least for six years and subsequently it is loaded into the CASTOR-440/84M casks with the type approval for transport and storage.

Each VVER 440/213 reactor core contains a total of 349 fuel assemblies; from which 312 are working and 37 are control rod assemblies.

7.2.1.1. SF Pools

Fuel assemblies are stored in SF pools using a compact rack with the capacity of 682 positions. This compact rack consisting of three sections is formed by hexagonal tubes made of a special material containing boron (ATABOR). The lower part of each tube is welded onto a support plate while the upper part is welded up. The entire tube bundle is tightened with a binding frame. The sections are connected with the support plate using trunnions.

The SF pool also contains a total of 17 hermetically sealed containers (enclosures) for storage of damaged fuel.

7.2.1.2. ISFSF Dukovany

The building of ISFSF Dukovany provides for the following basic storage functions:

- storage of 60 pcs of CASTOR-440/84 casks containing SF,
- handling of casks with a crane,
- reduction of radiation exposure outside of the building to the minimum, which is well below the permitted values,
- cooling of the stored casks and decay heat sink to the environment using natural aeration,
- assurance of working conditions for the personnel of ISFSF Dukovany,
- possibility to perform inspections and minor repairs of casks,
- protection against weather effects,
- prevention of unauthorized access - in conjunction with the physical protection system, and
- shielding from solar radiation.

The basic element of ISFSF Dukovany is the CASTOR-440/84 cask. It is used for transport and storage of 84 hexagonal SF assemblies from VVER 440 type reactor. In the cask the spent assemblies are stored dry in the environment filled with inert gas - He. In ISFSF Dukovany the casks are primarily used for storage while the transport function only serves to carry casks from/to ISFSF Dukovany. In the Czech Republic this cask has a type approval for SF transport and storage (dual purpose cask).

7.2.1.3. SFSF Dukovany

SFSF Dukovany was put into trial operation in December 2006, it has been in operation since April 2008 and its functions are identical to the conceptually similar ISFSF Dukovany which is connected to it via a passage corridor. The storage capacity has been designed for the expected operation period of NPP Dukovany, i.e. for 40 years. The operation period of SFSF Dukovany depends on the development and commissioning of DGR and the currently estimated period of operation is about 60 years.

Safety assurance during storage of spent fuel in SFSF Dukovany is based on properties of dual-purpose casks the design of which ensures meeting of all safety criteria, similarly as the

casks CASTOR-440/84 in ISFSF Dukovany. SFSF Dukovany uses only for casks of the type B (U) and S which have been type-approved under the Act No. 18/1997 Coll. and the related SÚJB Decree No. 317/2002 Coll.; the casks CASTOR-440/84M supplied by GNS mbH Essen were used for the first period of operation of SFSF Dukovany. Since 2013 the CASTOR-440/84M casks have been manufactured under a license and supplied by Škoda JS, a.s., Plzeň. In the future ŠKODA 440/84 casks will be in use.



Fig. 7.1 View of SFSF Dukovany (left) and ISFSF Dukovany (right)

7.2.2. Nuclear Power Plant Temelín

At the NPP Temelín site spent fuel is generated from two VVER 1000/320 reactors. Similarly to NPP Dukovany, the reactors are operated in refueling cycles where fuel resides in the reactor for a period of 4 years.

The core contains 163 fuel assemblies and 61 control elements laid out in a hexagonal array. The total weight of fuel load is 92 t. The characteristics of fuel assemblies VVANTAGE 6 that were used in the past are provided in the National Report under the Joint Convention, Revision 1.1 of February 2003.

In 2010 NPP Temelín changed its fuel contractor and started using the TVSA-T fuel type from the Russian Federation. The newly designed fuel system TVSA-T consists of fuel assemblies and core components. The fuel assemblies consist of a skeleton which is made up of a sliding end section, a base with a bottom node, one instrumentation and 18 guide tubes and an external structure of six angle brackets with attached 8 spacer grids. The fuel assemblies contain a bundle of 312 fuel elements.

More details about the design and operation of the fuel assemblies and the core are provided in the Czech Republic National Report under the Joint Convention, Revision 5.1 of April 2015.

7.2.2.1. SF pool

Fuel is unloaded from the reactor and consequently stored in the SF pool under water to ensure fuel shielding and cooling as needed. Boric acid is dissolved in water with the minimum concentration of 11.44 g/l. The water charge is cooled using three identical interconnected cooling circuits, while each circuit alone is able to cover with a big margin the normal operating heat load of the entire pool (i.e. without the emergency unloaded core) up to 2.83 MW_t.

If a cladding leak is identified on FAs, or fuel rods, during testing, the damaged elements may be placed into hermetically sealed containers. One section of the storage rack is reserved for these containers. If compact storage rack is used and the reactor runs in four-year fuel cycle, the size of SF pool allows to keep fuel in the main unit buildings for up to 12 years from reactor unload. The rack per unit provides a total of 705 storage positions of which 678 positions are intended for undamaged fuel assemblies and 25 positions for hermetic containers with damaged fuel assemblies, or damaged fuel rods, and 2 positions accommodate for cluster cases. A part of the storage rack, 163 positions, are always reserved for a one-off and complete core unload.

7.2.2.2. SFSF Temelín

SFSF Temelín was put into trial operation in September 2010. It performs identical functions as the conceptually similar storage facilities on the NPP Dukovany site

Safety assurance during storage of spent fuel in SFSF Temelín is based on properties of dual-purpose casks the design of which ensures meeting of all safety criteria. SFSF Temelín uses only casks of the type B (U)F and S which have been type-approved under the Atomic Act and the related SÚJB Decree No. 379/2016.; casks CASTOR-1000/19 supplied by GNS mbH Essen were used for the first period of operation of SFSF Temelín. In 2019 first loaded ŠKODA 1000/19 cask has been delivered to the facility.

7.2.3. Centrum výzkumu Řež s. r. o. (Building 211/7 - SF Storage Facility)

The storage facility is used for storage of activated probes, loops and other active experimental materials (pool B) and for storage of spent fuel from the LVR-15 reactor (pool A). The storage area itself consists of two pools made of stainless steel sheet and filled with demineralized water. The pool accessories include a technology circuit for water treatment and a water pump. Apart from the pools, there are additional dry stainless steel storage channels flush with the floor. The shielding of activated equipment in the pools is provided with a layer of water and in the dry channels with steel plugs. The activated equipment is transported from the reactor hall on a special motor car and the equipment is loaded on it in a container. The premises are equipped with a travelling crane and a crab.

As at December 31, 2019 the pool A contained 73 pcs of IRT-4M fuel and no fuel has been placed in the pool B (only old experimental equipment was stored in pool B).

7.2.4. ÚJV Řež, a. s. (Building 211/8 - HAW Storage Facility)

Bldg. 211/8 - HAW Storage Facility is used for storage of SF from nuclear reactors and the following RAW categories:

- RAW with higher activity, not complying with WAC for disposal in available facilities,
- solid non-standard waste.

Higher-activity RAW is kept fixed in concrete 216 liter barrels using storage boxes (II, IV, V). The non-standard solid RAW is stored in Box I and III. During the reconstruction of the high-level waste storage facility SF handling technologies were installed in Boxes VI - VIII.

Box	I.	–	Non-standard solid RAW suitable for disposal facility Dukovany
Box	II.	–	Conditioned RAW suitable for disposal facility Richard
Box	III.	–	Non-standard waste with nuclear materisl
Box	IV.	–	Conditioned RAW suitable for disposal facility Richard
Box	V.	–	Conditioned RAW suitable for disposal facility Richard
Box	VI.	–	Storage equipment (storage safe, empty, partly dismantled)
Box	VII.	–	Hot cell (partly dismantled)
Box	VIII.	–	Hot cell control room (partly dismantled)

7.3. Siting of Proposed Installations

Article 6 of Joint Convention:

1. *Each Contracting Party shall take the appropriate steps to ensure that the following procedures are established and implemented for a proposed radioactive waste management facility:*

- (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;*
- (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;*
- (iii) to make information on the safety of such a facility available to members of the public;*
- (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.*

2. *In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.*

Pursuant to Section (§) 47, paragraph 1 of the Atomic Act *“The site for a nuclear installation shall be evaluated in terms of*

- a) its characteristics that can affect nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security during the life cycle of the nuclear installation,*
- b) the impact of the nuclear installation on individuals, the general public, the society and the environment.”*

More details about siting of nuclear installations are provided in chap. 8.3.

7.4. Designing and Construction of Facilities

Article 7 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;*
- (ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;*
- (iii) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.*

The requirements for:

- a design of a nuclear installation and for designing of a nuclear installation are provided in Section (§) 46 of the Atomic Act and in the implementing **Decree No. 329/2017 Coll. on Requirements for Design of a Nuclear Installation**. A nuclear installation design under Section (§) 46, paragraph 2 of the Atomic Act shall, among other things, provide for meeting of requirements for technical means that ensure radiation protection and for radiation extraordinary event management. A nuclear installation design under Section (§) 46, paragraph 3 of the Atomic Act shall establish requirements for technical procedures and organizational measures for decommissioning of nuclear installations, and
- construction of a nuclear installation under Section (§) 50 of the Atomic Act. A licensee of construction of a nuclear installation shall perform testing of the nuclear installation and its parts in the course of construction of the nuclear installation in agreement with an inspection and test program.

The Decree on requirements for nuclear installation design regulates in detail:

- a) requirements for the content of documentation for a licensed activity,
- b) a list of safety functions to be fulfilled by a nuclear installation and their classification into categories based on their importance for nuclear safety,
- c) safety classes and criteria for classification of selected equipment into those categories,
- d) a method of assurance of in-depth protection, and
- e) the content of requirements for a nuclear installation design.

More details about designing and construction of nuclear installations are provided in chap. 8.4.

7.5. Safety Assessment of Facilities

Article 8 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;*
- (ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).*

Article 7 of the Directive:

- 2. Member States shall ensure that the national framework in place require license holders, under the regulatory control of the competent regulatory authority, to regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner. This shall be achieved through an appropriate safety assessment, other arguments and evidence.*
- 3. As part of the licensing of a facility or activity the safety demonstration shall cover the development and operation of an activity and the development, operation and decommissioning of a facility or closure of a disposal facility as well as the post- closure phase of a disposal facility. The extent of the safety demonstration shall be commensurate with the complexity of the operation and the magnitude of the hazards associated with the radioactive waste and spent fuel, and the facility or activity. The licensing process shall contribute to safety in the facility or activity during normal operating conditions, anticipated operational occurrences and design basis accidents. It shall provide the required assurance of safety in the facility or activity. Measures shall be in place to prevent accidents and mitigate the consequences of accidents, including verification of physical barriers and the license holder's administrative protection procedures that would have to fail before workers and the general public would be significantly affected by ionizing radiation. That approach shall identify and reduce uncertainties.*

In the course of a life cycle of every nuclear installation it is required to perform regular, systematic, comprehensive and verifiable assessment of the level of nuclear safety, radiation protection, technical safety, monitoring of radiation situation, radiation extraordinary event management and security and its documentation (Section (§) 48, paragraph 1 of the Atomic Act).

“Special safety assessment shall be conducted

- a) prior to implementing a modification in the use of nuclear energy,*
- b) in the case of a radiation extraordinary event at a nuclear installation or other nuclear installation of a similar type,*
- c) if so required by the office in a decision made in accordance with the requirements under an international agreement binding on the Czech Republic or an Euratom regulation, or*
- d) when it is suspected that the level of nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security has been compromised.” (Section (§) 48, paragraph 3 of the Atomic Act)*

The regulations for assessment of safety, method of its documentation, content of the documentation about safety assessment and the method of use of safety assessment are stipulated in the Decree No. 162/2017 Coll., on requirements for safety assessment.

7.5.1. Nuclear Power Plant Dukovany

7.5.1.1. Spent Fuel Pools

Spent fuel pools in the main production building are partial process units within these operating units and therefore their safety is not analyzed separately but as a part of safety reports mainly for reactor units. Safety reports for NPP Dukovany are developed separately for the reactors units (incl. SF pools), ISFSF Dukovany and SFSF Dukovany.

7.5.1.2. ISFSF Dukovany

The Final Safety Analysis Report, Revision No. 1 of July 1995 was one of the main input documents for SÚJB approval to commission ISFSF Dukovany. The approval was given in the SÚJB decision No. 245/95 of November 24, 1995.

Revision No. 2 of the above mentioned report followed in September 1996 and after it was reviewed, including other necessary documents, SÚJB issued decision No. 29/97 of January 23, 1997 to grant the license for permanent operation of ISFSF Dukovany.

Since 2017 the validity of the SÚJB licenses is usually unlimited and periodical safety assessments follow requirements of Sections (§§) 13 - 21 of the Decree No. 162/2017 Coll., on the Safety Assessment Requirements under the Atomic Act. ISFSF Dukovany is currently operated according to Revision No. 3 of the Final Safety Analysis Report from January 2000, which supported the SÚJB decision which in 2010 extended the operation of ISFSF Dukovany for additional 10 more years, until December 31, 2020.

7.5.1.3. SFSF Dukovany

The SÚJB approval for trial operation was based, among other documents, on the Final Safety Analysis Report, Revision 1 of September 2006. The approval for trial operation was issued for a period until December 31, 2008, while the minimum duration of commissioning shall be twelve months from the initial placement of loaded CASTOR - 440/84M cask in SFSF Dukovany storage hall and the number of loaded casks must not exceed 6 pieces.

After the successful completion and evaluation of the trial operation a license for operation was issued in October 2010 for SFSF Dukovany with the validity until 2014. The inputs for the license issuance included not only the above-mentioned FSAR, but also the "Summary Report on the course of SFSF operation in the period from 1 January 2008 - 31 July 2010", Licensing document, certificate of preparedness of the equipment and personnel for the operation of SFSF", "Licensing document, Schedule of SFSF Dukovany operation at NPP Dukovany", Limits and Conditions approved by a separate resolution, etc. In 2014 before the prescribed deadline the operator of SFSF Dukovany applied for a new license for another 10 years which has been approved and a new license has been issued that is valid until the end of 2025.

7.5.2. Nuclear Power Plant Temelín

7.5.2.1. Spent Fuel Pools

Identically as the spent fuel pools at NPP Dukovany, the SF pools are part of the main production buildings and therefore their safety is evaluated within the safety documents for NPP Temelín.

7.5.2.2. SFSF Temelín

The facility was in trial operation from September 2010 till December 2011 and after successful commissioning the operation license has been issued. The licensing process was based not only on the updated Final Safety Analysis Report but also on the "Evaluation of results of previous commissioning stages", "Evidence of implementation of previous decisions and conditions of the Office", "Evidence that facility and personnel are prepared for operation", "Operation time schedule", "Updated operational limits and conditions" etc. The operational license is valid till the end of 2021.

7.5.3. Centrum výzkumu Řež s. r. o. (Building 211/7 - SF Storage Facility)

The safety evaluation is provided in the annually updated Operational Safety Analysis Report for LVR - 15 reactor as a part of operational conditions for LVR-15 reactor.

A wet accumulator tank and pool A are used to store exposed fuel during the hold-up period, before it is moved into the HAW Storage Facility. The fuel assemblies in the wet accumulator tank and in the pool are placed in the storage racks that ensures subcriticality of the system. The fuel assemblies are stored in demineralized water with the same parameters as those prescribed for the primary circuit.

7.5.4. ÚJV Řež, a. s. (Building 211/8 - HAW Storage Facility)

7.5.4.1. HLW Storage Pool

Subcriticality of the HLW storage tank was verified by calculations using MCNP 4C program and a set of libraries with effective cross-sections DLC-200 dedicated to this program. Each calculation envisages that free space of the pool is evenly filled with water of different density. HLW storage pool meets the requirement for system subcriticality. For the pool flooded with water $k_{eff} = 0.459 \pm 0.016$. For the optimum moderation pool $k_{eff} = 0.737 \pm 0.017$.

The heat output of the stored spent fuel was determined for Pool B in the HAW Storage Facility under a shielding water layer. The total heat output of the stored spent fuel was determined based on the following initial conditions and assumptions:

- heat output was identified for full use of the storage pool capacity,
- generated residual heat for each fuel assembly in storage was calculated using the ORIGEN program, version 2.1, for IRT fuel - 2M (4-tube FA), with the enrichment 36 % wt. ^{235}U , burn-up rate 60 % (180 MWd/kg) and with the enrichment 80 % wt. ^{235}U , burn-up rate 55 % (350 MWd/kg),

The calculation was also made for the original fuel type EK - 10 fuel, with the enrichment 10 % wt. ^{235}U and burn-up rate 45 %.

7.5.4.2. Storage Equipment in the Facility

A calculation of subcriticality for the storage installation (storage safe), with the maximum capacity of 7 baskets with EK-10 fuel, was made as a part of documents for the first of two refurbishments of the RAW storage facility. In connection with the second refurbishment, which included the development of a storage annex for 16 Škoda VPVR/M casks, the safety documentation referred to assurance of subcriticality of the spent fuel in casks, which had been demonstrated during the type-approval of the cask. All computations were made on a conservative basis for fuel with the maximum multiplication capacity, i.e. for fresh fuel without burnup.

7.6. Operation of Facilities

Article 9 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) the license to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning program demonstrating that the facility, as constructed, is consistent with design and safety requirements;*
- (ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary*
- (iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;*
- (iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;*
- (v) incidents significant to safety are reported in a timely manner by the holder of the license to the regulatory body;*
- (vi) programs to collect and analyze relevant operating experience are established and that the results are acted upon, where appropriate;*
- (vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.*

The license issued by SÚJB under Section (§) 9, paragraph 1, letter f) of the Atomic Act is required for operation of every nuclear installation, i.e. for any individual facility for spent fuel management. Pursuant to Annex No. 1 to the Atomic Act, paragraph 1, letter f), the documentation for operation of a nuclear installation shall include:

1. management system programme,
2. limits and conditions,
3. programme of operational controls,
4. operating safety report,
5. list of selected equipment, including classification of selected equipment into safety classes,
6. ...,
7. list of activities relevant to nuclear safety and description of the system of education, training and exercises for the personnel, including a description of the qualifications of the personnel,
8. description of the system of training for selected workers,
9. certificate of readiness of the installation, personnel and internal regulations for the operation of the nuclear installation
10. ...,
11. evaluation of the results of trial operation if this is the first license for the operation of a nuclear installation,
12. operational programme, including the timetable
13. ...
14. physical protection assurance plan,
15. decommissioning plan,
16. estimation of decommissioning costs,
17. operational controlled ageing programme,
18. document demonstrating that safe radioactive waste management has been ensured, including the financing thereof, if radioactive waste is generated,

19. emergency operating rules,
20. severe accident management guidelines.

The general obligations of the licensee are provided in Section (§) 49 of the Atomic Act and they include e.g.:

- provide for and maintain the financial and human resources necessary to fulfil the obligations relating to nuclear safety, radiation protection, technical safety, radiation situation monitoring, radiation extraordinary event management and security,
- draw up and continuously update internal regulations according to the actual state of the nuclear installation to be in conformity with the nuclear installation design and cover all states of the nuclear installation envisaged in the nuclear installation design,
- execute an investigation of an operational occurrence, notify an operational occurrence to the office and take measures to prevent an operational occurrence and to remedy the state after an operational occurrence,
- document the steps within the feedback system, retain this documentation throughout the nuclear installation's life cycle.

7.6.1. Nuclear Power Plant Dukovany

7.6.1.1. Spent Fuel Pools

The SF pools are partial process facilities of the EDU reactor units and as such they do not require separate licenses for operation, no safety reports need to be elaborated for them or limits and conditions for safe operation; all these issues have been addressed within the operation of reactor units. Safety evaluation for NPP Dukovany reactor units has been in detail described in the National Report of the Czech Republic under the Convention on Nuclear Safety developed in April 2019.

7.6.1.2. ISFSF Dukovany

The construction of the ISFSF Dukovany building started after a demanding approval procedure in summer 1994. In less than a year the project was completed in summer 1995 and the first CASTOR-440/84 cask was delivered. Starting from September 1995 all tests and final adjustments of the facility were performed and the first filled cask was introduced into ISFSF Dukovany on December 5, 1995. At that moment also started the trial operation of the facility, which was scheduled to last 12 months. All design assumptions were verified during the trial operation and no serious non-nominal situations occurred. Therefore the trial operation was completed in January 1997 and ISFSF Dukovany moved into a permanent operation. The mentioned stages were supported with respective documents and the transition from one stage into another was conditional upon SÚJB approvals. The results of the storage facility operation provide verification of the results of the safety analyses and show its negligible effect on the environment.

As at December 31, 2019, the storage capacity of ISFSF Dukovany was fully used, i.e. 5040 SF assemblies were stored in 60 CASTOR-440/84 casks. The last cask was placed into ISFSF Dukovany on 8 March 2006 and since then the casks have been placed into SFSF Dukovany.

7.6.1.3. SFSF Dukovany

The construction of SFSF Dukovany started in April 2004 after the ending of approval procedure. In February 2006 the construction was completed and approved by the local competent building

authority. From November 2006 the storage facility was in trial operation when all the design assumptions were verified, similarly as in the case of ISFSF Dukovany. In 2008 SÚJB started an administrative procedure to issue a license for its operation, which was concluded with the license issuance in October 2010. The results of the storage facility operation verify the results of the safety analyses and show its negligible effect on the environment.

7.6.2. Nuclear Power Plant Temelín

7.6.2.1. Spent Fuel Pools

Identically as in NPP Dukovany, SF pools in NPP Temelín are partial process facilities of reactor units and as such they do not require individual licenses for operation, individual safety reports or technical specifications for safe operation and all these issues are addressed within the operation of reactor units. Safety evaluation for NPP Dukovany reactor units has been in detail described in the National Report of the Czech Republic under the Convention on Nuclear Safety developed in April 2019.

7.6.2.2. SFSF Temelín

The construction of SFSF Temelín was performed in agreement with the Czech Republic's government resolution No. 121/1997 of 5 March 1997, in which the government recommended construction of SF storage facilities on the sites of the operated NPPs. The advantage of the concept is an elimination of spent fuel transport outside the NPP complex and the use of the existing NPP sites without the necessity to intervene in intact landscape. At the same time, the development of SFSF Temelín respects the Czech Republic's government resolution No. 487/2002, which approved the Policy for RAW management and SF management.

The development of SFSF Temelín included, among other activities, also an analysis of environmental impacts of SFSF Temelín, issuance of affirmative positions by MŽP and the European Commission, issuance of the planning permit by the Regional Office of the South Bohemian region, issuance of resolutions by SÚJB that permitted construction of SFSF Temelín and issuance of the building permit by MPO for the SFSF Temelín project. The construction started in March 2009 and as early as in August 2010 SÚJB issued a license to commission SFSF Temelín. The trial operation of SFSF Temelín started on September 9, 2010 by placement of the first loaded cask into the SF storage facility. SFSF Temelín is in operation since December 2011. The results of the storage facility operation provide verification of the results of the safety analyses and show its negligible effect on the environment.

7.6.3. Centrum výzkumu Řež s. r. o. (Building 211/7 - SF Storage Facility)

The SF Storage Facility is a part of LVR-15 reactor and therefore it does not have a separate license for operation. Written programs and working procedures are provided for activities significantly affecting nuclear safety and activities important for radiation protection. The documents are developed in the form of organizational procedures of ÚJV Řež, a. s. and working procedures for LVR-15 reactor working place.

7.6.4. ÚJV Řež, a. s. (Building 211/8 - HAW Storage Facility)

The working and technological procedures effective until 2006 for the operation of HAW Storage Facility are explained in detail in the National Report under the Joint Convention, Revision 1.1 of February 2003 and in the National Report of the Czech Republic under the Joint Convention, Revision 2.3 of September 2005. The following documents approved by the respective SÚJB resolutions were in effect as on 31 December 2019:

- OLCs of HAW Storage Facility (Building 211/8), Reg. No. PP 2404 291, Revision No. 01, from 30 August 2017,
- Delimitation of controlled zone of HAW Storage Facility (Building 211/8), Reg. No. PP 2404 297, Revision No. 01, ze dne 8 December 2017,
- Monitoring programme of HAW Storage Facility (Building 211/8), Reg. No. PP 2404 296, Revision No. 01, from 8 December 2017,
- Onsite emergency plan, Reg. No. PI 1600 016, Revision No.14, from 28 November 2019,
- Decommissioning plan of HAW Storage Facility (Building 211/8), Reg. No. DPP 2400.04, Revision No. 01, from 26 February 2016,
- List of selected equipments, Reg. No. 4.4.2/315, Edition No. 1, Revision No. 2, from 19 December 2006,
- Programme of operational controls of HAW Storage Facility (Building 211/8), Reg. No. PP 2404.11, Edition No. 1, Revision No. 0, from 13 January 2012
- Management system of RAW Management Centre, Reg. No. PSR 2400 006, Revision No. 03, from 20 September 2019.

7.7. Disposal of Spent Fuel

Article 10 of the Joint Convention:

If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

In agreement with the Policy for radioactive waste and spent fuel management of 2019 the Czech Republic is planning to develop a national DGR in magmatic crystalline rocks (granites or homogenous gneiss massifs) after 2050 and it should start the operation in 2065. The program of DGR development started back in 1992 (in the first year jointly with the Slovak Republic). Based on previously collected geological data, 30 potential locations were gradually identified in the Czech Republic. Based on a subsequent screening and utilization of basic geological criteria 12 potential locations were selected with varied geological conditions and diverse host rocks. The first geological survey was performed on six locations with granitic massifs in 2003 - 2005, without utilization of surface survey methods, and areas were selected for future prospecting stage of the geological survey. The works were suspended in 2005 due to public resistance. The next period was used for intensive negotiations with the affected municipalities and with the general public. A Working Group for Dialogue about the Deep Geological Repository was established in late 2010 with the objective to improve transparency of the process to select the future DGR location while taking into account interests of the public. In 2015, the Working Group was transformed as a part of the Government Council on Energy and Raw Materials Strategy. SÚRAO had expected that the geological works would start in 2011-2012 on those sites where municipalities would be voluntarily involved in the site selection process. However this process

was finished and in 2016 some representatives of NGOs and mayors of some considered sites left the Working Group.

In 2014, communication between SÚRAO and SÚJB in the field of DGR development intensified. A Memoranda of Understanding was signed on cooperation in the field of DGR development in the Czech Republic, which defines the general framework of cooperation of both institutions necessary for the successful DGR development, in particular the selection of DGR site.

In 2015 -2016, geological work was carried out on several sites, and in subsequent years further geological research work continued.

The year 2018 was marked by the elaboration and assessment of the documents for the Government of the Czech Republic supporting the selection of four from nine DGR candidate sites. The Authority asked the SÚJB to review the Study of Initial Safety Reports for each of nine candidate sites. The SÚJB's detailed comments on these Studies were sent to the Authority's Director in the annex to the letter in December 2018. Also in 2018, the SÚJB's internal project, which was launched in 2015, was successfully completed. An initial computer model of the DGR reference site was prepared, which in the future should enable the SÚJB to assess the suitability of the individual disposal concepts and locations of the future DGR.

In 2019 the Policy was again updated and site work continued to identify four of the nine DGR candidate sites, namely geophysical measurements at all locations. In mid-November 2019, the work of Advisory Panel of Experts was launched. The Advisory Panel of Experts was the advisory body of the Authority's Director and guaranteed the professional level, objectivity, openness and transparency of the selection process of four sites, including the evaluation and analysis of the outputs from this process. In June 2020 the Authority has reduced the number of considered DGR sites to four.

DGR is expected to accommodate all RAW that cannot be disposed in near-surface disposal facilities, SF declared as RAW and, if needed, also HLW from potential reprocessing of SF from NPP Dukovany and NPP Temelín and SF and HLW from other nuclear installations. Four units of NPP Dukovany will generate a total quantity of 1740 t HM and two units of NPP Temelín will generate 1750 t HM for the planned operation of all the units. If the operation period of NPP Dukovany is extended to 60 years then the total quantity of SF from that source increases by about 690 t of heavy metals and if the operation period of NPP Temelín is also extended to 60 years then the quantity of SF will increase to about 720 t of heavy metals. Further, the development of two new units in the NPP Temelín site and one new unit in the NPP Dukovany site, would increase the total quantity of SF by about 5010 t of heavy metals. Based on the current estimates the demand for the disposal capacity of DGR may be about 10 000 t HM.

Tab. 7.1 Anticipated timetable for DGR preparation, construction and operation according to the Policy (2019)

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 standpoint of the communities concerned	2022
Selection of the final site including the standpoint of the communities concerned and submission of an application for land protection at the selected site	2025
Commencement of the EIA process for the underground laboratory at the final site	2026
Submission of an application for planning permission for the URL at the final site	2028
Commencement of the EIA process for DGR	2035
Submission of documentation for DGR planning permission to all authorities concerned including the SÚJB (initial safety report)	2040
Submission of documentation for construction permission	2045
DGR construction (including the first disposal section) and drafting of commissioning documentation	2050–2064
Drafting of documentation for DGR operation authorisation, operational licence	2063–2065
Commencement of DGR operation	2065

8. Safe Radioactive Waste Management - Articles 11 - 17 of the Joint Convention

8.1. General Safety Requirements

Article 11 of Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

- (i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;*
- (ii) ensure that the generation of radioactive waste is kept to the minimum practicable;*
- (iii) take into account interdependencies among the different steps in radioactive waste management;*
- (iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;*
- (v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;*
- (vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;*
- (vii) aim to avoid imposing undue burdens on future generations.*

The Atomic Act in Section (§) 109, paragraph 2 requires any person managing RAW to take into account all their physical, chemical and biological properties that might affect safety of the waste management.

The issues of subcriticality and residual heat removal concern particularly the future disposal of spent nuclear fuel. Pursuant to Section (§) 110 of the Atomic Act, in addition to the requirements arising from other provisions of this Act, the same requirements as those applicable to radioactive waste shall apply to spent fuel until such time that the spent fuel is declared radioactive waste by the producer in the radioactive waste accompanying document or by the Office by its decision. The Decree No. 21/2017 Coll., in connection with this provisions establishes:

- in Section (§) 13 requirements for assurance of subcriticality: *“In the course of storage of ... irradiated nuclear fuel and its handling meeting of requirements must be assured for subcriticality established in the Decree on requirements for nuclear installation design. The keeping of subcriticality shall be monitored. Keeping of subcriticality and its monitoring shall be documented“ and*
- in Section (§)14 for removal of heat: *“In the course of handling of spent nuclear fuel it is required to practically exclude ... damage of the fuel by effects of residual heat“.*

In connection with minimization of generation of radioactive waste the Atomic Act in Section (§) 111, paragraph 1, letter b) clearly requires to restrict the quantity of generated RAW by technical and organizational measures. A licensee for management of radioactive waste shall once a year

submit to SÚJB a document called evaluation of RAW management which shall also include proposals for improvement (minimization of generation of radioactive waste) and their implementation. The main part of minimization of radioactive waste consists in segregation of the collected waste and in application of effective separation methods.

The Atomic Act, specifically Section (§) 111, paragraph 1, letter e), requires to take into account mutual links between individual steps in RAW management. It takes into account the fundamental principle that any activity in each individual step of RAW management shall not have a negative effect on subsequent activities.

The Czech legislation in radiation protection has been developed based on internationally recognized standards and criteria. The legislation is based on the IAEA GSR Guideline Safety Series, Part 3, and on EU legislation - Directive No. 2013/59/Euratom. Three fundamental pillars of radiation protection have been employed - optimization, justification and limitation and these have been integrated into the Atomic Act and the Decree No. 422/2016 Coll., on radiation protection and security of a radioactive source. In the Czech Republic no RAW management shall be permitted without a license (Section (§) 9 of the Atomic Act) issued by SÚJB. Before the license is issued the applicant shall, among other things, to demonstrate through the documents required under the Atomic Act that he is able to ensure radiation protection in the scope and at the level required by the Atomic Act and its implementing regulations. The provision of the radiation protection is verified by inspections before the license is issued.

In order to meet the requirement to avoid actions that have practical impacts on future generations or impose undue burdens on future generations, the applicable provision is Section (§) 108, paragraph 2 of the Atomic Act stating that: *“Radioactive waste and spent fuel may only be managed so that it does not impose undue technical, economic and social burdens on current and future generations.”* One example of application of this provision is the provision of Section (§) 82, paragraph 1 of the Atomic Act stating that: *“Anyone who performs an activity involving radiation shall ensure that, as a result of this activity, including in the case of accumulation of a radioactive substance discharged from the workplace, the dose constraints for the representative person of 0.25 mSv per year ... are applied in the optimization of radiation protection.”* The radiation activities include RAW management which is also subject to all requirements for safe management of sources of ionizing radiation.

8.2. Existing Facilities and Past Practices

Article 12 of the Joint Convention:

Each Contracting Party shall in due course take the appropriate steps to review:

- (i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;*
- (ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.*

8.2.1. Nuclear Power Plant Dukovany

Assessment of safety of all facilities for RAW management was initially performed in agreement with safety requirements specified in the Act No. 28/1984 Coll., on state nuclear safety supervision of nuclear installations, and its implementing regulations. Based on a favorable assessment of the submitted documents (see 8.4) and results of the inspections a license was issued for their permanent operation. Requirements for safe RAW management corresponded to the then recognized international standards.

Subsequently, the safety of all facilities for RAW management was re-assessed in agreement with the safety requirements for these facilities specified in the Atomic Act and its implementing regulations. Based on this assessment SÚJB issued for EDU a license for RAW management under Section 9, paragraph 1, letter j) of the Act No. 18/1997 Coll.. The license was issued for a limited period of time and before its expiry the facility's safety shall be re-assessed again. The safety of these facilities, i.e. RAW management facilities, is on regular basis evaluated by the operator in agreement with its internal quality assurance documents.

8.2.1.1. System for Treatment of Liquid Radioactive Media

The system includes 6 technological sets for treatment of liquid radioactive media (SVO-1 through SVO-6).

The objective of treatment of liquid radioactive media is to concentrate radioactive substances contained in them into the smallest possible volume. The cleaned media are reused in the radiation controlled area of NPP Dukovany.

The systems are shared by reactor units 1 and 2 (HVB I) and units 3 and 4. (HVB II).

More details about SVO are provided in the National Report of the Czech Republic under the Joint Convention, Revision 2.3 of September 2005.

8.2.1.2. System for Storage and Processing of Liquid Radioactive Waste

The storage facility for liquid radioactive waste consists of a process node of radioactive sorbent tanks and a process node of radioactive concentrate tanks. Liquid radioactive waste is processed in the node for solidification of radioactive concentrate.

The storage facility for liquid radioactive waste is used for collection and storage of radioactive concentrate before its processing (bituminization). It contains a process node of radioactive sorbent tanks with sorbents from all filtration stations in HVB BAPP and a process node of radioactive concentrate tanks to store radioactive concentrate from SVO 3 evaporators.

The systems are shared by reactor units 1 and 2 (HVB I) and units 3 and 4. (HVB II). The system for processing of liquid radioactive waste with bituminization is shared by all 4 reactor units.

The process system "Bituminization" is used for processing of radioactive concentrate by its immobilization in bitumen, i.e. into a form suitable for disposal. The key process equipment is a film rotor evaporator in which both the components (radioactive concentrate and bitumen) are spread on the inside perimeter of a (heated) jacket and the water evaporates. The resulting mixture of bitumen containing salts flows down on the walls into the bottom part of the evaporator. The product is filled into 200-liter drums. The drums containing radioactive waste are transported on a belt conveyor. Full drums are cooled and covered with a lid by means of a manipulator, removed from the belt and moved into a handling area.

Radioactive sludge and spent ion exchangers are conditioned using aluminosilicate matrix ALUSIL[®], i.e. into a form suitable for disposal. The key parts of equipment are a stirrer and a dosing equipment. Radioactive sludge (ion exchangers) are mixed with individual immobilizing components in 200-liter drums. After hardening the drum with the product of immobilization is covered with a lid and moved into a handling area.

8.2.1.3. System for Collection, Storage and Conditioning of Solid Radioactive Waste

Collection, storage and conditioning of solid RAW is situated in the BAPP building at a segregation workplace and storage of solid RAW. Each subsystem is common for the reactor units 1 and 2 and for units 3 and 4. Solid RAW is stored in box pallets, i.e. low-pressure compacted in 200-liter drums.

A part of solid waste suitable to be cleared from the workplace is officially measured to check the content of radionuclides after its previous segregation and measurements. This is performed in the newly refurbished building "Auxiliary Boiler House" subject to the monitored zone regime. The waste that meet criteria specified in the Decree No. 422/2016 Coll. is cleared from the workplace to a dump for solid municipal waste in Petřůvky, after announced to the SÚJB.

The remaining part of solid RAW is processed or conditioned (incineration, high-pressure compacting) in external (foreign) technological facilities and disposed in RAW disposal facilities. Untreated solid radioactive waste is stored in the storage facility for solid RAW.

8.2.2. Nuclear Power Plant Temelín

Safety assessment of all facilities for RAW management was performed at NPP Temelín in agreement with the safety requirements specified for these facilities in the then effective Atomic Act and its implementing regulations. Based on a favorable assessment of the submitted documents (see 8.6) and results of the inspections a license was issued for their trial operation. NPP Temelín is a holder of the license for RAW management under Section (§) 9, paragraph 3, letter a) of the Atomic Act. Operability and safety of the facilities for RAW management are regularly monitored and evaluated by the operator.

The following technology systems for RAW management are now situated in the Auxiliary Service Building of NPP Temelín:

- systems for conditioning of liquid radioactive media,
- systems for storage and conditioning of liquid RAW,
- systems for collection, storage and conditioning of solid RAW.

8.2.2.1. System for Treatment of Liquid Radioactive Media

The system includes 6 technological sets for treatment of liquid radioactive media (SVO-1 through SVO-6). The objective of treatment of liquid radioactive media is to concentrate radioactive substances contained in them into the smallest possible volume. The cleaned media are reused in the radiation controlled area of NPP Temelín.

More details about SVO are provided in the National Report of the Czech Republic under the Joint Convention, Revision 2.3 of September 2005.

8.2.2.2. System of Storage and Conditioning of Liquid RAW

The storage facility for liquid RAW includes interim storage for liquid radioactive waste which consists of a process node of radioactive sorbent tanks and of a process node of radioactive concentrate tanks. Liquid radioactive waste is processed in the node for solidification of radioactive concentrate.

The interim storage for liquid RAW serves to accumulate and store concentrated RAW before further conditioning (bituminization). One technological node includes tanks with sorbents to store sorbents from all filtration stations in HVB and BAPP, another technological node includes tanks with concentrate containing radioactive concentrate from SVO 3 evaporators.

The technological node for solidification of liquid RAW carries out immobilization of concentrated forms of liquid RAW in bitumen, i.e. the form suitable for disposal. The main process equipment is a filter rotor evaporator where the two components (concentrated liquid RAW and bitumen) are spread on an internal jacket surface and excess water is evaporated. The resulting product flows down into the evaporator bottom part and is filled via a stop valve into 200-liter drums. The drums are moved under the evaporator on a round 16 – positions carousel. Once a drum is filled it remains on the carousel for several hours and the product cools down. Then it is covered with a lid, taken down from the carousel and moved to a handling annex on a rail-borne platform. Drums filled with the bituminous product are regularly transported into the radioactive waste disposal facility.

Sludge and ion exchangers are conditioned by immobilization in aluminosilicate matrix using mobile equipment.

8.2.2.3. System of Collection, Storage and Conditioning of Solid RAW

The system includes:

- collection and handover places
- segregation and fragmentation workplace,
- storage of solid RAW.

Collection, storage and conditioning of solid RAW is situated in the BAPP building at a segregation workplace and storage for solid RAW. Each system is common for the reactor units 1 and 2. Solid RAW is stored in 200-liter drums (partly by low-pressure compacting).

A part of the waste suitable for clearance from the workplace is, after previous segregation and measurements, officially measured to check the content of radionuclides. This is performed in the newly refurbished building "Auxiliary Boiler House" - subject to the monitored zone regime at the NPP Dukovany site. RAW that meets legal criteria is cleared from the workplace or disposed into the solid municipal waste dump facility Petrůvky.

The remaining part of solid radioactive waste is processed or conditioned (incineration, high-pressure compacting) in external (foreign) technological facilities and disposed in radioactive waste disposal facilities. Untreated solid radioactive waste is stored in the storage facility for solid radioactive waste.

8.2.3. SÚRAO

The safety of disposal facilities is made out by not exceeding the radiation limits and the dose optimization limits. For radiation workers, a limit of 20 mSv per calendar year is set for the sum of the effective doses from external exposure and the effective dose rates from internal irradiation, for the inhabitants of 1 mSv per calendar year. The dose optimisation limit of the representative person is set at 250 μ Sv per year and for radiation workers the optimisation limit shall be determined by the licensee in his monitoring programme. All this is demonstrated in documents supporting the application for a license to operate the disposal facility (particularly in safety analyses from which operational limits and conditions for the disposal facility operation are derived) under the Atomic Act in documents supporting the application for a license to manage RAW under the same Act. Before issuing the licenses SÚJB verifies compliance of the actual status with the documents by inspections.

8.2.3.1. RAW Disposal Facility Richard

RAW Disposal Facility Richard has been developed in a complex of the former limestone mine Richard II (inside the Bídnice hill - 70 m under the ground level). Its communication corridor is 6 - 8 m wide and 4 - 5 m tall. Individual disposal chambers are accessible from the corridor.

Since 1964 the disposal facility has been used to dispose institutional waste (RAW from utilization of radioisotopes in medical care, industry and research). The total volume of adapted underground premises exceeds 17 000 m³, while the capacity for waste disposal is about a half of the volume and the rest are service galleries. Safety of the operating disposal facility is checked by a monitoring system in agreement with a monitoring program approved by SÚJB. The method of the disposal facility closing has been assessed by safety analyses.

Based on findings from hydrogeology, geology engineering, geotechnical and seismic surveys, construction expert reports and the condition of disposed containers it is possible to conclude that throughout the location all requirements for radiation protection and nuclear safety have been met on a long-term basis in compliance with the Atomic Act and its implementing regulations. The disposal facility has been operated based on a license issued by SÚJB.



Fig. 8.1 View into a disposal chamber of RAW Disposal Facility Richard

8.2.3.2. RAW Disposal Facility Bratrství

The disposal facility is designed exclusively for RAW containing natural radionuclides.



Fig. 8.2 View into a disposal chamber of RAW Disposal Facility Bratrství

The disposal facility was developed by adaptation of a gallery in a former uranium mine, while five chambers were adapted for waste disposal with the total volume of nearly 1200 m³. The disposal facility started operating in 1974. The mine is situated in a water-bearing crystalline complex and therefore a drainage system has been built in the surroundings of the disposal facility area with a central retaining tank and flow-through retaining tanks. The removed water is monitored. It has been concluded that the site on a long-term basis meets all requirements for radiation protection and nuclear safety. The disposal facility has been operated based on a license issued by SÚJB.

8.2.3.3. RAW Disposal Facility Dukovany



Fig. 8.3 Closing a full vault with concrete

RAW Disposal Facility Dukovany has been developed in the site of NPP Dukovany to dispose of conditioned RAW from the NPPs. A potential release of radionuclides into the biosphere is prevented by a system of barriers with a long service lifetime. The disposal facility has been in operation since 1995. The total volume for waste disposal is 55 000 m³ (about 180 000 200-liter drums) is sufficient to accommodate all RAW from NPP Dukovany and NPP Temelín, provided the

waste meets acceptance conditions for disposal, even in the case the operation time of the plants is extended to 40 years. Safety of the operating disposal facility is checked by a monitoring system in agreement with a monitoring program approved by SÚJB. The method of the disposal facility closing has been assessed by safety analyses. The disposal facility is operated based on a license for operation issued SÚJB.



Fig. 8.4 View of a partly filled vault in RAW Disposal Facility Dukovany

8.2.3.4. RAW Disposal Facility Hostim

RAW Disposal Facility Hostim was in operation in 1959 - 1964. It was built in 1959 in the limestone mine Alkazar nearby the village of Hostim by adaptation of two galleries driven in 1942 -1944. The total volume of the two galleries was about 1690 m³. The disposal facility contains low-and intermediate-level waste from ÚJV Řež, a. s. and former ÚVVVR. The operation of the disposal facility was terminated in 1965.

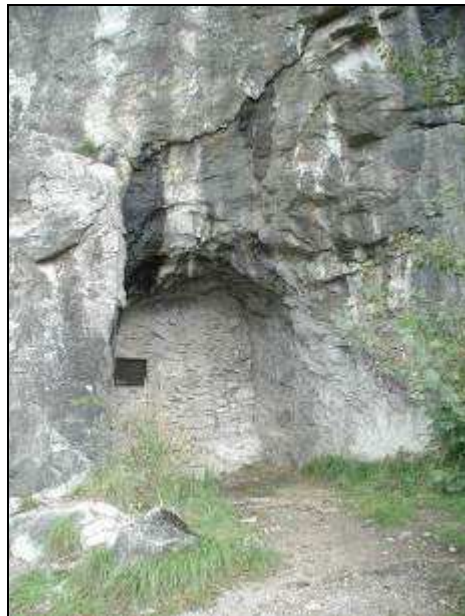


Fig. 8.5 Secured entrance into the RAW Disposal Facility Hostim

To assure safety of the disposed RAW (an additional barrier preventing unauthorized persons from entering) both galleries were filled with a special concrete mixture. Before the filling,

inventory taking was performed and all long-term radionuclide sources and chemical waste were removed from the disposal facility.

In 1990-1991 a hydrogeological monitoring system of institutional inspection was developed and it has been operated by SÚRAO. Also a network was established of geodynamic points to measure movements of the rock massif. The monitoring results have proved tightness and safety of the closed disposal facility. The disposal facility has been closed since 1997.

8.2.4. ÚJV Řež, a. s.

ÚJV Řež, a. s. has three operating facilities for RAW management:

- building 241 - Velké zbytky (RAW Management Facility) with technology for RAW management,
- building 211/6 - Reloading site for RAW,
- building 211/8 - HAW Storage Facility.

Apart from the mentioned facilities, there are two additional facilities (storage area for RAW and decay tanks for RAW in the building 211/5) that had been in the past used for RAW management purposes. By now they have been removed or they are not planned to be used for RAW management any more.

8.2.4.1. Building 241 - Velké zbytky

The building 241 contains the following process equipment for RAW management:

- FDC - installation for fragmentation and decontamination of RAW. FDC also serves as a development base to improve the existing methods and to develop new decontamination procedures and technologies,
- equipment for compacting of solid compressible RAW - low-pressure hydraulic press for compressible RAW (paper, PE, rubber, cellulose wadding, etc.),
- solidification of liquid and solid RAW by cementation - for both solid and liquid (concentrate) RAW.

In 2011-2013 the Building 241 was reconstructed. The objective of reconstructions and modifications was to ensure a long-term, safe, reliable and economical operation of the equipment for RAW management. Another objective was to increase the capacity for RAW management to meet the contractual requirements (management of RAW from external generators, remediation of environmental liabilities in ÚJV Řež, a. s., etc.)

More details about the reconstruction of the building 241 are provided in the Czech Republic National Report under the Joint Convention, Revision 5.1 of April 2015.

8.2.4.2. Building 211/8 - HAW Storage Facility

The HAW Storage Facility has been designed to store SF from research nuclear reactors and solid RAW. The facility is a prefab hall with the ground dimensions 12 x 72 m, 15 meters high. Inside it is divided into eight concrete square-shaped boxes to store solid RAW. Two cylindrical tanks are used for SF of IRT-M type. Each box contains a tank of carbon steel lined by stainless steel set in a concrete bed. The tank diameter is 4.6 m, water level 5 m. Storage boxes are divided horizontally into three levels with concrete panels. The upper covering layer consists of two shielding panels.

For more details about modifications in the building 211/8 are provided in the Czech Republic National Report under the Joint Convention, Revision 5.1 of April 2015.

8.3. Siting of Proposed Facilities

Article 13 of the Joint Convention:

1. *Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:*
 - (i) *to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;*
 - (ii) *to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;*
 - (iii) *to make information on the safety of such a facility available to members of the public;*
 - (iv) *to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.*
2. *In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.*

The legislative framework for siting of RAW disposal facilities and workplaces for RAW management in nuclear installations from the viewpoint of nuclear safety and radiation protection consists of the Atomic Act and its implementing regulations:

- Decree No. 378/2016 Coll., on siting of nuclear installations,
- Decree No. 21/2017 Coll., on assurance of nuclear safety of nuclear installations.
- Decree No. 408/2016 Coll., on requirements for the management system,
- Decree No. 422/2016 Coll., on radiation protection and security of radionuclide sources,
- Decree No. 361/2016 Coll., on security of nuclear installations and nuclear material.

As indicated in chapter 5.2.2, siting of a nuclear installation is one to the activities requiring a permit from SÚJB, in agreement with provisions of Section (§) 9, paragraph 1, letter a) of the Atomic Act, from the viewpoint of nuclear safety and radiation protection.

Details of the content of the siting licence application are set out in the National Report under the Joint Convention, Revision 6.0, April 2017.

Pursuant to Section (§) 208, letter o) of the Atomic Act, SÚJB shall provide information about management of spent nuclear fuel and radioactive waste. For this reason SÚJB shall once a year elaborate a report about management of RAW and post it on its website.

Based on bilateral intergovernmental agreements with the Federal Republic of Germany and Austria, the Czech Republic submits to the governmental bodies of those countries the information on its near-boarder nuclear installations. Transmission of the information is performed both on a regular basis (meetings held once a year) and on an irregular basis at agreed meetings or in a written form.

The Czech Republic has entered a general intergovernmental agreement about exchange of information concerning utilization of nuclear energy with another neighboring country - Slovakia. The obligation to inform about serious events in nuclear safety is contractually established also in an agreement on cooperation in state supervision of nuclear safety of nuclear installations and state supervision of nuclear materials between the Czech Republic and the Republic of Hungary.

An intergovernmental agreement about early notification of nuclear accidents and exchange of information concerning utilization of nuclear energy, nuclear safety and radiation protection has been concluded between the governments of the Czech Republic and Poland.

8.3.1. Nuclear Power Plant Dukovany

At the moment, EDU is not planning to site any additional facility for RAW management. Siting of the existing buildings and facilities for RAW management took place within the siting process of the entire NPP as described in the Initial Safety Report. A detailed description of the geographic location and protection against earthquake, floods, adverse climatic conditions, effects of aircraft crash, pressure waves from explosions and interventions by third persons is provided in the National Report of the Czech Republic under the Joint Convention, Revision 1.1, of February 2003.

8.3.2. Nuclear Power Plant Temelín

At the moment, NPP Temelín is not planning to site any additional facility for RAW management. Siting of the existing buildings and facilities for RAW management took place within the siting process of the entire NPP as described in the Initial Safety Report. Similarly as in the case of EDU, more detailed information about the site and its protection against various natural and man-induced events is provided in the National Report of the Czech Republic under the Joint Convention, Revision 1.1, of February 2003.

8.3.3. SÚRAO

The Czech Republic currently anticipates operating a DGR in granitic formations after 2065. More details about the issue are provided in 7.7.

8.3.4. ÚJV Řež, a. s.

At the moment ÚJV Řež, a. s. is not planning to site any additional facility for RAW management. Siting of the existing buildings and facilities for RAW management (Building 241 and HAW Storage Facility) took place within the proceedings to site the entire nuclear installation under the valid legislation. Safety of the facilities has been reassessed in agreement with the Atomic Act and its implementing regulations, as required for the siting, design, construction and operation of nuclear installations.

8.4. Design and Construction of Facilities

Article 14 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;*
- (ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;*
- (iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;*
- (iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.*

The legislative framework to permit designing and construction of a nuclear installation from the viewpoint of nuclear safety and a radiation protection consists of the Atomic Act and its implementing regulations, particularly:

- Decree No. 21/2017 Coll., on assurance of nuclear safety of nuclear installations.
- Decree No. 408/2016 Coll., on requirements for the management system,
- Decree No. 422/2016 Coll., on radiation protection and security of radionuclide sources,
- Decree No. 361/2016 Coll., on security of nuclear installations and nuclear material,
- Decree No. 329/2017 Coll., on on requirements for a design of a nuclear installation.

Details of the content of the construction licence application are set out in the National Report under the Joint Convention, Revision 6.0, April 2017.

8.4.1. Nuclear Power Plant Dukovany

Removal of radioactive sediments (sludges, borate crystals) from storage tanks for radioactive concentrates started in 2014 as a part of the LTO project for NPP Dukovany. This RAW is conditioned into aluminosilicate matrix ALUSIL[®]. In 2017-2019 193 t of radioactive sediments from tanks 7TW10B05, 7TW10B03, 7TW10B04, 0TW10B04 was processed into the form acceptable for the disposal facility Dukovany. The resulting volume of the product placed in the disposal facility was 268 m³. The removal of radioactive sediments and the cleaning of storage tanks for radioactive concentrate provided a storage reserve of 3400 m³. The removal of radioactive sediments will continue in the coming years.

Decommissioning of facilities for RAW management is performed in agreement with the concept of NPP Dukovany decommissioning. Conceptual plans for decommissioning of facilities for RAW management, and on as-needed basis also technical measures, are taken into account already in the designing stage.

8.4.2. Nuclear Power Plant Temelín

The basic design for NPP Temelín, and therefore also facilities for RAW management, was elaborated by the Czech designing organization Energoprojekt. The design was assessed in the early 1990s by independent experts in RAW management. An overview of the implemented changes is provided in the National Report of the Czech Republic under the Joint Convention, Revision 1.1, of February 2003.

In the period evaluated herein 1 – 2 m³ of radioactive sludge from the wastewater centrifuge node was conditioned every year into aluminosilicate matrix ALUSIL[®] at Dukovany site.

Decommissioning of facilities for RAW management is addressed in agreement with the NPP Temelín decommissioning concept. Conceptual plans for decommissioning of facilities for RAW management are taken into account already in the designing stage, including adoption of technical measures on an as-needed basis.

8.4.3. SÚRAO

8.4.3.1. RAW Disposal Facility Richard

RAW Disposal Facility Richard is designed to dispose RAW containing artificial radionuclides.

The disposal facility is situated on the north-western edge of the Litoměřice cadaster area under the Bídnice hill. In the past there were three limestone quarries in the location (now called Richard I - III) and there was an underground factory construction during the World War II. Limestone had been quarried here until 1960s by company "Čížkovické cementárny a vápenky". In the early 1960s the mine work Richard II was identified as a potential disposal facility for low-level waste.

The disposal facility is situated in a carbonate bank, with overlying and underlying clayey rocks.

The mine premises and disposal rooms are dry. The only leakage of underground water in the disposal facility premises occurs in the entrance portal and from ventilation chutes. Additional water gets into the disposal facility by condensation of water from forced ventilation. The seeping and condensing water in the disposal facility are drained into the mine drainage system. The mine water from the Richard disposal facility (in orders of tenths of liters per second) is drained through a system of retaining tanks into a public sewerage system. The mine water is monitored before it is discharged into the sewerage system.

Moreover, 13 drills have been made in the Richard disposal facility to monitor hydrogeological conditions in the concerned area, 9 of which for monitoring purposes and the remaining ones for prospecting purposes.

From the geotechnical viewpoint the mine can be considered as stable.

Based on the earlier performed prospecting works, regular geotechnical monitoring was introduced in 1992 in the location that focuses on the disposal facility safety from the viewpoint of its stability.

Radiation protection is performed by monitoring in agreement with a monitoring program approved by SÚJB. A concept has been approved for the disposal facility's closure and decommissioning.

8.4.3.2. RAW Disposal Facility Bratrství

RAW Disposal Facility Bratrství in Jáchymov is designed to dispose RAW consisting of or contaminated with natural radionuclides of the radium and thorium series. The disposal facility was developed particularly to dispose leaking and disused radioactive sources from healthcare facilities.

The Bratrství in Jáchymov disposal facility has been developed from a part of abandoned underground premises in the former uranium mine Bratrství.

Two factors are specific for the disposal facility operation:

- high humidity in the underground premises and a substantial flow rate of mine water nearby the disposal chambers,
- high concentration of radon decay products (not generated by the disposed RAW but by natural activity of the host environment) which makes it necessary to maintain a special regime.

The mine work is stable from the geotechnical viewpoint.

Based on earlier performed extensive prospecting works, regular hydrological and geotechnical monitoring was introduced in 1992 in the location and it focuses on the disposal facility safety from the viewpoint of its stability.

Radiation protection is ensured by monitoring in agreement with a monitoring program approved by SÚJB.

A concept has been approved for the disposal facility's decommissioning and closure.

8.4.3.3. RAW Disposal Facility Dukovany

RAW Disposal Facility Dukovany has been in permanent operation since 1995. It consists of 112 vaults arranged in four rows, each with 28 vaults sized 5.3 x 5.4 x 17.3 m. Four vaults make up 1 dilatation unit, with a free space between the dilatation units filled with wood-cement board. Each vault is covered with 14 sloping panels of three types. The engineering barriers in RAW disposal facility are represented by the waste form itself (bitumen, aluminosilicate), walls from reinforced concrete and asphalt-propylene layer. RAW disposal facility Dukovany is situated above the underground water level and has a double drainage system.

The filled vaults are covered with concrete (and topped with a thick-wall PE). Once the disposal facility is filled the construction will be insulated from the top (to prevent rainwater from permeating).

The radiation protection is ensured by monitoring in agreement with a monitoring program approved by SÚJB. A concept has been approved for the disposal facility's closure and decommissioning.

8.4.3.4. RAW Disposal Facility Hostim

RAW Disposal Facility Hostim developed in the former limestone mine Alkazar near Beroun was in operation in 1959 - 1964. It was established based on the Governmental resolution No. 231/1979 and related resolutions by the Ministry of Chemical Industry.

RAW is disposed in the disposal facility in two galleries:

- Gallery A was adapted and used by the former ÚJF Řež (predecessor of ÚJV Řež, a. s. and ÚJF AV ČR). The RAW was stored free (in tins, glass jars, air-conditioning filters),
- Gallery B was used by ÚVVVR Praha within the framework of the then established and state-subsidized system for collection and disposal of RAW.

The RAW was mostly stored in 60 l zinc-plated drums (containers) and some contaminated voluminous equipment was free disposed.

The operation of the RAW Disposal Facility Hostim was terminated by a decision issued by the Regional Hygienic Officer in 1965, which anticipated that the waste would be disposed here "forever". The resolution was in agreement with the then effectual regulations and the state took charge of the future safety of the Hostim disposal facility. The disposal facility has been closed since 1997.

The land over RAW disposal facility Hostim is administered by the Town Office in Beroun. The disposal facility is now in the protected landscape area Český kras and the national preserve Karlštejn. The disposal facility is not classified as an old mine work and therefore it is not supervised by the Ministry of the Environment. In 1990 the Hostim disposal facility was included into the system of disposal facilities provided for and funded by ČSKAE (due the state-guaranteed care for old loads).

8.4.4. ÚJV Řež, a. s.

8.4.4.1. Building 241 -Velké zbytky

The design of the building 241 was elaborated in 1957, its construction was completed in 1962 and in 1963 it was put into operation. It was designed and provided with technology for processing of liquid and solid RAW. Since at that time the documents supporting building inspectors' approval were confidential the procedure was performed again in 1996 in agreement with the Act No. 50/1976 Coll.

The project of refurbishment of the evaporation system was prepared in 1987. The main technological units were delivered to ÚJV Řež, a. s. in 1988. Preparatory installation works started in 1988, the installation of the new evaporator in agreement with the design adapted in 1988 started in 1989 and was completed in August 1990. Comprehensive non-active tests were performed in August - December 1990. After the comprehensive tests ČSKAE, based on a request made by ÚJV Řež, a. s., approved in 1992 the evaporation system into trial operation. In 1994 SÚJB issued a decision to approve the limits and conditions of the evaporation system for concentration of liquid RAW and approved its permanent operation. The evaporation system was decommissioned based on the SÚJB resolution No. SÚJB/OZ/23118/2012 of 11 September 2012; the decommissioning was completed in 2014, information about the completed decommissioning was provided to SÚJB by means of a final report (Decommissioning of the evaporation technology for processing of liquid RAW in the building No. 241 Velké zbytky in the complex of ÚJV Řež, a. s., Reg. No. Z – ÚJV 4280, February 2015). A new two-stage evaporation technology was installed for processing of liquid RAW in 2014. On the basis of the submitted evaluation of the comprehensive equipment tests the active trial operation was allowed. The active trial operation was successful, the test criteria were met. On the basis of the evaluation of the ÚJV Řež, a. s. the licence for the active operation of the evaporative station has been asked for. SÚJB approved the OLCs of the liquid RAW evaporating system and licensed its continuous active operation in 2014.

The fragmentation and decontamination center was put into operation in 1995. The center was rebuilt in 2012–2013; two new stainless steel boxes were installed on the workplace, the first one for solid RAW decontamination and the second one for solid RAW fragmentation. Both boxes are connected to the special facility sewer and air-conditioning system. In addition, the fragmentation box is fitted with a so-called knock filter for the capture of solid particles generated in particular by oxygen flame and plasma fragmentation. In 2014, decontamination technology was installed - a box for abrasive blasting by metal crushing with filtration system allowing the capture and recycling of abrasives before entering the building air-conditioning system.

A decommissioning concept has been approved by SÚJB for the facility.

8.4.4.2. Building 211/8 - HAW Storage Facility

The facility construction took place in 1981 - 1988 and later it was modified based on the requirements made by ČSKAE and SÚJB. The facility construction was completed in 1995. The HAW Storage Facility was put into trial operation based on a resolution issued by SÚJB in 1995 for a period of one year and into permanent operation in 1997.

The Final Safety Analysis Report for the HAW Storage Facility (Building 211/8) from 1995 was elaborated as a part of documents submitted in 1995 by ÚJV Řež, a. s. to support the application for trial operation of the HLW store facility. The report included:

- initial data specification and introductory information,

- an overview of data describing the project siting,
- monitoring of the surroundings and impact on the environment,
- description of the building and materials assumed to be stored,
- description of handling and transport of the materials and safety analyses.

The documents also included a preliminary proposal of a decommissioning method for the HAW Storage Facility.

After the submitted documents were favorably assessed SÚJB approved permanent operation of the HAW Storage Facility. At the same time, SÚJB approved the limits and conditions for the regular operation of the HAW Storage Facility.

A decommissioning concept has been approved by SÚJB for the facility.

8.5. Assessment of Safety of Facilities

Article 15 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;*
- (ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;*
- (iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).*

Article 7 of the Directive:

- 2. Member States shall ensure that the national framework in place require license holders, under the regulatory control of the competent regulatory authority, to regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner. This shall be achieved through an appropriate safety assessment, other arguments and evidence.*
- 3. As part of the licensing of a facility or activity the safety demonstration shall cover the development and operation of an activity and the development, operation and decommissioning of a facility or closure of a disposal facility as well as the post- closure phase of a disposal facility. The extent of the safety demonstration shall be commensurate with the complexity of the operation and the magnitude of the hazards associated with the radioactive waste and spent fuel, and the facility or activity. The licensing process shall contribute to safety in the facility or activity during normal operating conditions, anticipated operational occurrences and design basis accidents. It shall provide the required assurance of safety in the facility or activity. Measures shall be in place to prevent accidents and mitigate the consequences of accidents, including verification of physical barriers and the license holder's administrative protection procedures that would have to fail before workers and the general public would be significantly affected by ionizing radiation. That approach shall identify and reduce uncertainties.*

As described in the previous chapter 8.4., an applicant for a license for construction of RAW management facility, which is a part of a nuclear installation, shall meet the requirement specified in the chapter, i.e. to submit an initial safety report. The report shall include safety analyses and an analysis and evaluation of radiation extraordinary events. Any changes performed in the course of the operation, significant from the viewpoint of nuclear safety, are subject to a license under Section (§) 9, paragraph 1, letter h) of the Atomic Act and in the case of reconstructions or changes affecting radiation protection under Section (§) 9, paragraph 2, letter c) of the Atomic Act.

For more information about the legislative framework regulating assessment of safety see chap. 7.5.

8.5.1. Nuclear Power Plant Dukovany

Systematic safety assessments and evaluation of impacts on the environment have been performed of the RAW management facilities that are currently in operation, as appropriate for the risks represented by such facilities and covering their service lifetime in the scope and for the manner required by the valid legislation. The assessment and evaluation are documented in the Final Safety Analysis Report.

For management of liquid RAW the causes of integrity defects in the considered system have been defined and evaluation has been performed of the final consequences and probability of the given initiation event and adverse impacts on the environment. The most serious incident, defined as leakage of radioactive materials, is a damage of tanks with the liquid media. The event may occur only as a result of a seismic event accompanied by destruction of the building structure and permeation by radioactive materials through all process and construction barriers. Calculation models have shown that even if conservative assumptions are used and for the scenario of leakage of all liquid RAW from the storage tanks into watercourses, a representative person will receive the effective dose of 0.6 mSv/year. In the scenario of the waste leakage into the underground water the effective dose will be 0.06 mSv/year. The limit of effective dose (sum of effective doses from external exposure and effective dose rates from internal exposure) for an individual from population is 1 mSv/year.

Another potential incident with a substantial impact on the environment is a fire of the bituminization line. Results of calculations of radiological impacts of the bituminization line fire have implied that even under the most conservative assumptions (the model e.g. anticipates that the person in the afflicted area will only eat food from the local sources) the individual effective dose for a representative person will not exceed 0.3 mSv/year. The Decree SÚJB No. 422/2016 Coll. defines a general limit for the population, as a sum of effective doses from external exposure and effective dose commitments from internal exposure, at 1 mSv per calendar year.

The most significant incident in the management system for gaseous RAW (due to the maximum potential impact on the surroundings of the nuclear power plant) is a damaged integrity of the system of cleaning of technological venting in the main production building. Using a standard calculation model the annual effective dose for a representative person is max. 21.3 μ Sv. This means that the basic safety limit of 1 mSv/ year is complied with.

8.5.2. Nuclear Power Plant Temelín

A systematic safety assessment and evaluation of impacts on the environment were performed before the beginning of construction of the RAW management facilities that are currently in operation, as appropriate for the risks represented by such facilities and covering its service lifetime in the scope and for the manner required by valid legislation. The assessment and evaluation are documented in the Final Safety Analysis Report.

For management of liquid RAW the causes of integrity defects in the considered system have been defined and evaluation has been performed of the final consequences and probability of the given initiation event and adverse impacts on the environment. The most serious incident, defined as leakage of radioactive materials, is damage of tanks with the liquid media. The event may occur only as a result of a seismic event accompanied by destruction of the building structure and permeation by radioactive materials through all process and construction barriers. Calculation models have shown that even if conservative assumptions are used and for the scenario of leakage of all liquid RAW from the storage tanks into watercourses, an individual from a critical group of population will receive an effective dose 0.066 mSv/year. In the scenario of the waste leakage into the underground water the effective dose will be 0.001 mSv/year.

The model situation during RAW management, in which the largest volume of released activity is due to fire, is an accident in which the combustible RAW is burned in a storage installation within controlled zone in BAPP. All conservative assumptions were considered within the calculation. The age category of adults is considered and a local consumption basket was conservatively used for the calculation (only locally grown food is consumed, etc.). The maximum calculated values for the exposure of a representative person range from 0,003 mSv/year to 0,006 mSv/year. This is well below the limit of the effective dose of an individual from the population, which is 1 mSv/year

Another potential radiation extraordinary event with a substantial impact on the environment is a fire of the bituminization line. Results of calculations of radiological impacts of the bituminization line fire have implied that even under the most conservative assumptions (the model e.g. anticipates that the person in the afflicted area will only eat food from the local sources) the individual effective dose for an individual from population will not exceed 0.00128 mSv/year. The SÚJB Decree No. 422/2016 Coll. defines a general limit for the population as a sum of effective doses from external exposure and effective doses commitment from internal exposure, at 1 mSv per calendar year.

Even when dealing with solid RAW, radiation extraordinary event may occur. This event could lead to the potential release of radioactive substances into the environment, namely the fire of combustible solid RAW in the storage installation. The results of the calculations of the radiation effects of fire of stored conditioned RAW indicate, that the individual effective dose of the representative person does not exceed 0,006 mSv/year.

The most significant incident in the management system for gaseous RAW (due to the maximum potential impact on the surroundings of the nuclear power plant) is a damaged integrity of the system of cleaning of technological venting in the main production building. Based on the standard calculation model, the annual effective dose for an individual from the population is max. 0.304 mSv. This means that the basic safety limit of 1 mSv/year is complied with.

The values of the effective dose of a representative person obtained from the calculations of the radiation consequences of all three of the above mentioned radiation extraordinary events are

significantly lower than the value of the general limit for residents, which SÚJB Decree No. 422/2016 Coll. sets at 1 mSv per calendar year.

8.5.3. SÚRAO

8.5.3.1. RAW Disposal Facility Richard

A revision of safety analyses for RAW Disposal Facility Richard was prepared in 2016 which is a continuation of safety analyses and their revisions performed in 1995 - 2013 and it has been used as a supporting document for the application for a license to operate the disposal facility.

The safety analyses performed in 2003-2016 were supposed to verify the disposal facility capacity and to reassess the already proposed closure and decommissioning method. The efforts included safety evaluations for options with and without a backfilling material in the disposal facility premises, taking into account the updated information on the source term, including RAW inventory and employment of different types of filling materials, particularly bentonites and materials on cement basis. The transport model has been updated using data from the newly made drill holes to further specify hydrogeological data in the location.

Safety analyses evaluate the individual doses received by persons in the following scenarios:

- transport of radionuclides in the disposal facility and underground water in the case of barriers damage,
- scenario in which persons enter the disposal facility and scenario with the persons stay in the location.

The transport of radionuclides was considered in two variants - with and without a backfilling material. The scenarios were anticipated to take place after termination of institutional control, i.e. 300 years after the operation of the facility is finished. Individual doses calculated for the real disposal facility system (inventory, construction design, host rock environment) were compared with applicable limits and the acceptance criteria for RAW in the disposal facility Richard Litoměřice have been proposed based on the comparison.

In 2019, a revision of safety analyses was prepared, including a revision of the hydrogeological model. Furthermore, the new safety analysis will consider the optional extension of disposal capacity to previously unused premises in the northern part of the disposal facility.

8.5.3.2. RAW Disposal Facility Bratrství

The safety analyses performed in 2003-2013 were supposed to verify the disposal facility capacity and to propose limits and conditions for its operation. The efforts included safety evaluations for options with and without a backfilling material in the disposal facility premises, taking into account the updated information on the source term, including RAW inventory and employment of different types of filling materials, particularly bentonites and materials on cement basis.

The safety analyses evaluate individual personal doses in the following scenarios: transport of radionuclides in the disposal facility and underground water in the case of barrier damage, scenario in which persons enter the disposal facility and scenario with the persons stay in the location. The transport of radionuclides was considered in two variants - with and without a backfilling material. The scenarios were anticipated to take place after termination of institutional control, i.e. 120 years after the operation of the facility is finished. Individual doses calculated for the real disposal facility system (inventory, construction design, and host rock environment) were

compared with applicable limits and the acceptance criteria for RAW in the Bratrství disposal facility have been proposed based on the comparison.

In 2019, a revision of safety analyses was prepared, including a revision of the hydrogeological model.

8.5.3.3. RAW Disposal Facility Dukovany

A license to operate the disposal facility was issued based on safety analyses (Operational Safety Report) and the trial operation in 1995.

In 2012 safety analyses were completed that were based on operational experience in the disposal facility. The analyses were used to update the acceptance criteria for RAW Disposal Facility Dukovany in connection with other potential forms of RAW, incl. institutional waste, to be disposed here. Subsequently, waste acceptance criteria have been formulated for solidified RAW conditioned in bitumen, cement and aluminosilicate and non-solidified RAW and the inventory of monitored radionuclides has been updated to take into account potential hazards of the whole range of the produced radionuclides.

The safety analyses evaluate individual personal doses in the following three scenarios: bathing, transport of radionuclides in the disposal facility and underground water in the case of barrier damage, scenario in which persons enter the disposal facility and scenario with persons stay in the location. The scenarios were anticipated to take place after a termination of institutional control, i.e. 300 years after the operation of the facility is finished. Individual doses calculated for the real disposal facility system (inventory, construction design, host rock environment) were compared with applicable limits and the acceptance criteria for RAW in the RAW Dukovany disposal facility have been proposed based on the comparison. The acceptance criteria are formulated separately for solidified and non-solidified waste

In 2012 the Operational Safety Report was updated within the licensing process for the RAW disposal facility Dukovany. Inputs for the report included, among other, safety analyses completed in 2005 and 2006 which evaluated the potential for a limited disposal of institutional RAW and selected types of RAW, specifically sorbents and sludge, in an aluminosilicate matrix. The safety report also updated safety analyses concerning operational safety and evaluation of extraordinary events in respect to safety of personnel and of the surrounding environment. The new version of the operational and post-operational safety measures anticipates that the disposal facility will be used for low-level waste from both the nuclear power plants and for institutional RAW; the disposal of solidified RAW has been evaluated for three basic types of immobilization materials - bitumen, cement and aluminosilicate. A new calculation of the source member has been performed, using the option to evaluate advection and diffusion transports in the near field. The safety evaluation was performed with a computer tool standardized every three years by an SÚJB commission in charge of software assessment. The results have been used to improve accuracy of determination of limits for critical radionuclides monitored considering the current acceptance criteria. Operational safety report was updated in 2012 using the existing RAW inventory and updated hydrogeological transport model.

Updating of the safety report was performed in 2016. Existing operational and long-term safety assessment has been updated based on an analysis of operational events and qualitative assessment of long-term scenarios.

In 2019, a revision of safety analyses was prepared, including a revision of the hydrogeological model.

8.5.3.4. RAW Disposal Facility Hostim

In 1991 - 1994 an inventory was taken of the disposed RAW and radiation and mining surveys were performed inside both the galleries (the information was physically checked that sources and containers with high activity had been in 1964 moved from the gallery B into the RAW Disposal Facility Richard). Hydrogeological evaluation of the location was performed, evaluation of potential accident scenarios and a monitoring system was developed (surface and underground water, geotechnical stability).

The performed analyses have implied that the risks associated with reprocessing and transport of the RAW into another location would be significantly higher than those associated with the existing disposal facility. The disposal facility has been filled with a concrete mixture and closed. The monitoring program approved by SUJB determines the annual period of surface and underground water control. The exact period of institutional control was not determined but SURAO expects to monitor this site at least for another 50 years.

8.5.4. ÚJV Řež, a. s.

8.5.4.1. Building 241 - Velké zbytky

A safety evaluation of the facility was performed before the construction start, in agreement with legal regulations valid at the time of the construction.

Safety evaluation of the evaporation system and fragmentation and decontamination center was performed and approved by SÚJB based on the information provided in the National Report of the Czech Republic under the Joint Convention, Revision 2.3 of September 2005.

Safety analyses of RAW management have been updated in 2019 and submitted together with the required documentation for the licensed activity in the framework of the RAW management license application.

8.5.4.2. Building 211/8 - HAW Storage Facility

Safety evaluation of the facility was performed before the construction start, in agreement with legal regulations valid at the time of the construction.

Safety analyses have been updated in 2017 and submitted together with the required documentation for the licensed activity in the framework of the NI (Building 211/8 - HAW Storage Facility) operation license application.

8.6. Operation of Facilities

Article 16 of Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that:

- (i) the license to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;*
- (ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;*
- (iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a*

disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

- (iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;*
- (v) procedures for characterization and segregation of radioactive waste are applied;*
- (vi) incidents significant to safety are reported in a timely manner by the holder of the license to the regulatory body;*
- (vii) programmes to collect and analyses relevant operating experience are established and that the results are acted upon, where appropriate;*
- (viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using Information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;*
- (ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.*

The legislative framework for the license to operate RAW disposal facilities and facilities for RAW management in nuclear installations from the viewpoint of nuclear safety and radiation protection consists of the Atomic Act No. 263/2016 Coll. and its implementing regulations

As stated in chapter 5.2.2, the commissioning and operation of RAW disposal facilities and RAW management facilities in nuclear installations are activities subject to the SÚJB license under Section (§) 9, paragraph 1, letters e) and f) of the Atomic Act. A precondition of such licenses for commissioning of a nuclear installation without a nuclear reactor and for operation of a nuclear installation is the approval of all the following documents: limits and conditions, program of operational controls, list of elected equipment, plan for assurance of physical protection nuclear installation and a decommissioning plan. More documentation to be submitted by the applicant to SÚJB for assessment with an application for license for commissioning of a nuclear installation without a nuclear reactor and for operation of a nuclear installation is provided in Annex No. 1 to the Atomic Act (see also chap. 7.6).

After a favorable assessment of the above-mentioned documents SÚJB will issue a license for operation of a nuclear installation. The limits and conditions for safe management of RAW, which is a document to be approved under Annex No. 1 to the Atomic Act, Part 3, letter a), item 6, shall be established based on safety analyses and they include, pursuant to Section (§) 9, paragraph (3) of Decree No. 377/2016 Coll., the following

- a) waste acceptance criteria, which contain:
 - 1. safety, technical, and administrative conditions and limits for characteristic properties of radioactive waste that is accepted for disposal; and
 - 2. the way of ensuring that the properties of the radioactive waste or packaging containing radioactive waste comply with these conditions and limits;
- b) the location of the radioactive waste or packaging and how they are handled;
- c) the scope, methods, and deadlines for measuring and evaluating limited parameters;
- d) operability requirements for selected equipment for radioactive waste management;
- e) configuration requirements for the protective system of a workplace for radioactive waste management;
- f) limits for conditional parameters;
- g) requirements for personnel activity and for organizational measures leading to the fulfilment of all defined conditions for design operating conditions;

- h) requirements for fulfilling nuclear safety, radiation protection, and radiation situation monitoring requirements after a radioactive waste disposal facility has been closed, in the case of disposal of radioactive waste in a radioactive waste disposal facility; and
- i) a draft measure for managing radioactive waste that fails to meet waste acceptance criteria stipulated in limits and conditions.

RAW may be managed only by a licensee under Section (§) 9, paragraph 3 of the Atomic Act. The license may be issued only based on a favorable assessment of documents required by the same Act and based on favorable results of inspections and may be issued only if the applicant is the licensee under Section (§) 9, paragraph 2, letter f) for management of sources of ionizing radiation.

8.6.1. Nuclear Power Plant Dukovany

NPP Dukovany is a licensee for RAW management under Section (§) 9, paragraph 3, letter a) of Act No. 263/2016 Coll. This means that all requirements have been met for safe management of RAW as specified in the Atomic Act and its implementing regulations, particularly the Decree No. 377/2016 Coll.

The OLCs for RAW management are defined based on safety analyses and approved by SÚJB as a part of documents to obtain a license for RAW management. The prescribed period for their revising is 4 years.

The internal procedures for operation, maintenance, monitoring, inspections and tests of facilities for RAW management are developed in agreement with the procedures specified in the Atomic Act and its implementing regulations and they are a part of documents supporting an application for the license to manage RAW. The monitoring program shall be approved by SÚJB.

The requirement for technical and engineering support is established in ČEZ, a. s. internal documents and it is a part of the corporate strategy.

In NPP Dukovany the procedures for characterization and sorting of RAW is described in the internal regulations inspected by SÚJB. The regulations comply with the requirements of the Decree No. 377/2016 Coll. for sorting and characterization of RAW.

The obligation of the licensee holding a license for RAW management to promptly report events important from the viewpoint of nuclear safety and radiation protection is established in the Atomic Act. In NPP Dukovany the reporting procedures for accidents are described in the internal regulations dealing with radiation extraordinary event management.

Programs for accumulation and analyses of significant operating experience are used in NPP Dukovany in all areas of operation, i.e. also in RAW management. Outputs from the analyses are routinely used to modify the related procedures.

In each of the years two inspections of RAW management were conducted at NPP Dukovany, which concentrated on compliance with limits and conditions for safe RAW management and on compliance with Act No. 263/2016 Coll. and Decree No. 21/2017 Coll. and 377/2016 Coll. Results of the inspections did not indicate any violation of the above mentioned regulations.

A proposed method of NPP decommissioning is approved by SÚJB as a part of the license to operate the plant. The document content complies with the requirements of the Decree No. 185/2003 Coll. The costs of decommissioning are verified at the same time. ČEZ, a. s., creates a financial reserve for decommissioning of NPP Dukovany. A decommissioning plan is under the Decree No. 377/2016 Coll. approved for five years (current version from 2018). Also the verification of decommissioning costs is valid for the same period of time.

8.6.2. Nuclear Power Plant Temelín

NPP Temelín is a holder of the license for RAW management under Section (§) 9, paragraph 3, letter a) of Act No. 263/2016 Coll. This means that all requirements have been met for safe management of RAW as specified in the Atomic Act and its implementing regulations, particularly the Decree No. 377/2016 Coll.

The limits and conditions for safe management of RAW is defined based on safety analyses and approved by SÚJB as a part of documents to obtain license for RAW management. The prescribed period for their revising is 4 years.

The internal procedures for operation, maintenance, monitoring, inspections and tests of facilities for RAW management are developed in agreement with the procedures specified in the Atomic Act and its implementing regulations and they are a part of documents supporting an application for the license to manage RAW. The monitoring program shall be approved by SÚJB.

The requirement for technical and engineering support is established in ČEZ, a. s. internal documents and is a part of the corporate strategy.

In NPP Temelín the procedures for characterization and sorting of RAW is described in the internal regulations inspected by SÚJB. The regulations comply with the requirements of the Decree No. 377/2016 Coll. for sorting and characterization of RAW.

The obligation of the licensee holding a license for RAW management to promptly report events important from the viewpoint of nuclear safety and radiation protection is established in the Atomic Act. In NPP Temelín the reporting procedures for accidents are described in the internal regulations dealing with radiation extraordinary event management.

Programs for accumulation and analyses of significant operating experience are used in NPP Temelín in all areas of operation, i.e. also in RAW management. Outputs from the analyses are routinely used to modify the related procedures.

In each of the years two inspections of RAW management were conducted at NPP Temelín which concentrated on compliance with the limits and conditions for safe management of RAW and compliance with Act No. 263/2016 Coll. and Decree No. 21/2017 Coll. and 377/2016 Coll. Results of the inspections did not indicate any violation of the above mentioned regulations.

A proposed method of NPP decommissioning is approved by SÚJB as a part of the license to operate the plant. The document content complies with the requirements of the Decree No. 377/2016 Coll. Meanwhile, the costs of decommissioning are verified by SÚRAO. ČEZ, a. s., creates a financial reserve for the decommissioning of NPP Temelín. The proposal for decommissioning is under the Decree No. 377/2016 Coll. approved for five years (current version from 2019). Also the verification of decommissioning costs is valid for the same period of time.

8.6.3. SÚRAO

8.6.3.1. RAW Disposal Facility Richard

The disposal facility's safety was assessed using requirements of the Act No. 28/1984 Coll. and its implementing regulations, subsequently, in agreement with the Atomic Act No. 18/1997 Coll. and its implementing regulations and, since January 2017, in agreement with the Atomic Act No. 263/2016 Coll. and its implementing regulations. As disposal of RAW in underground premises represents a special interference in the earth's crust the safety evaluation of the disposal facility took into account also Section (§) 34, paragraph 1 of the Act No. 44/1988 Coll.

The disposal facility is operated in a standard manner in agreement with the operating regulations, with the limits and conditions for safe operation with the acceptance conditions. Current maintenance is performed in the underground part of the mine and in the surface facilities.

The volume activity of mine water is monitored in agreement with the monitoring program in samples collected at the disposal facility entrance - in the retention tank. The results of monitoring demonstrate that the volume activity limits in mine water have not been exceeded in the course of the monitored period.

8.6.3.1.1. Volume activity of ^3H radionuclide in the atmosphere

The volume activity of ^3H has been monitored in three points in the disposal facility. In 2019, the maximum value was set at 0,5 kBq/m³. The limit volume activity for the disposal facility atmosphere is 3.10⁴ Bq/m³.

8.6.3.1.2. Limit of Rn equivalent volume activity intake in the atmosphere

The EOAR action levels under the monitoring programs are set at 6000 Bq/m³. In the case of exceeding of the action level no persons are allowed to stay under the ground. In the course of 2019 the measured EOAR values ranged 1 – 2812 Bq/m³.

8.6.3.1.3. Maximum intake

The maximum observed effective dose of the worker as a result of radon inhalation was 2.29 mSv in 2019. This dose is also evaluated for the contractor's workers who carry out work on the first stage of the reconstruction of ÚRAO Richard and show a much longer period of stay in controlled zone compared to the normal operation of the repository. For more information on disposal facility's reconstruction, see chapter 10. 11.4.1.

In connection with the limits and conditions for safe operation a verification is performed of electric equipment operability, forklift truck operability, passability of the drainage system and operability of the instrumentation.

Since the beginning of the operation RAW has been always disposed in agreement with the waste acceptance criteria valid in the given period. When disposing the waste the operator checks it for:

- damage of the container,
- surface contamination of the container,
- dose rate equivalent on the container surface,
- content of radionuclides.

The individual containers are placed in disposal rooms.

Individual containers are disposed to maximize utilization of the space in the rooms, up to 5 layers (from the viewpoint of strength capacity up to 8 layers may be stacked without damage of the bottom layer of the casks).

In addition to the monitoring of parameters important from the viewpoint of radiation protection, also basic climatic and hydrological data and geotechnical parameters are measured in the location.

RAW in which the content of radionuclides exceeds the waste acceptance criteria for disposal is, in agreement with the limits and conditions for storage of RAW, stored separately from the disposed RAW (they include particularly radionuclides ^{60}Co , ^{137}Cs , ^{241}Am , ^{238}Pu and ^{239}Pu).

Tab. 8.1 Summary data on RAW Disposal Facility Richard (as on December 31, 2019)

Beginning of operation	1964
Scheduled end of operation	Not before 2025
Repository depth under the surface	70 - 90 m
Total volume adapted for the disposal facility	18 900 m ³
Filled volume of disposal chambers	8 201 m ³
Free volume	2 047 m ³
Access tunnel and other corridors (including that to Richard I)	8 652 m ³
Activity converted as in 2019	See chapter 4.2.3.1.

In 2019 two inspections of RAW management were conducted at the Richard disposal facility which concentrated on compliance with the limits and conditions for safe management of RAW, WAC for disposal and WAC for storage and on meeting of requirements set in applicable legislation. One additional inspection was conducted that focused on meeting of requirements for radiation protection and one on meeting of requirements for security of NI.

8.6.3.2. Disposal Facility Bratrství

The disposal facility's safety has been assessed using requirements of the Act No. 263/2016 Coll. and its implementing regulations.

The utilization of underground premises for RAW disposal is classified as a special interference in the earth's crust and a decree issued by ČBÚ establishes basic obligations for its operation. These requirements extend requirements resulting from the Atomic Act particularly with the following:

- monitoring of geotechnical parameters of the underground premises,
- monitoring of airstreams.

A standard container used for RAW disposal has been a sandwich disposal unit with the volume of 200 l with anticorrosion finish. The drums are laid down flat in layers up to about 2 m.

Table 8.2 Summary data about the RAW Disposal Facility Bratrství (as on December 31, 2019)

Beginning of operation	1972
Scheduled end of operation	after 2025
Repository depth under the surface	more than 50 m
Total volume adapted for the disposal facility	3 600 m ³ (from which 1 200 m ³ for disposal)
Filled volume of disposal chambers	954 m ³ (volume of disposed RAW 381.6 m ³)
Free volume	2460 m ³ in corridors, 0 m ³ in disposal rooms
Activity converted as in 2019	See chapter 4.2.3.2

The monitoring of the disposal facility, persons, surroundings and discharges is performed in agreement with the monitoring program for the Bratrství disposal facility approved by SÚJB. Inspections in the disposal facility are performed on a regular basis in agreement with the monitoring program, as well as in connection with working activities on as-needed basis. The inspections focus particularly on activity of mine water from ²²⁶Ra, ²³²Th and radon transformation products and on air activity from radon transformation products. The air in the disposal facility is monitored based on a contract with SÚJCHBO Příbram - Kamenná and ÚJV Řež, a. s. (²³²Th). Analyses of discharged water and water samples from the workplace and its surroundings are performed on a contractual basis in the laboratories of SÚJCHBO and ÚJV Řež, a. s.

The RAW disposed in the Bratrství disposal facility is mostly RaSO₄ in platinum cases (medical sources), Ra-Be neutron sources, laboratory waste containing natural radionuclides, depleted uranium and natural thorium (mostly as Th(NO₃)₄·5H₂O and ThO₂).

The overall inventory of selected radionuclides disposed in the disposal facility shall not exceed 1.10¹³ Bq of natural radionuclides.

In 2019 one inspection of RAW management focused on compliance with OLCs, WAC for disposal and one inspection of radiation protection were performed in the Bratrství disposal facility.

8.6.3.3. RAW Disposal Facility Dukovany

The disposal facility's safety has been assessed using requirements of the Act No. 263/2016 Coll. and its implementing regulations.

The limits and conditions for safe operation define conditions under which the disposal facility may be operated:

- the tanks are monitored for presence of water,
- drainage water from inspection tanks is monitored,
- passability of the drainage system is checked (once a year),
- the instrumentation is checked for operating ability.

Tab. 8.3 Summary data on RAW Disposal Facility Dukovany (as on December 31, 2019)

Beginning of operation	1995
Scheduled end of operation	2090
Repository depth under the surface	0 m
Total volume adapted for the disposal facility	55 000 m ³
Filled volume	12 565 m ³
Free volume	42 435 m ³
Activity converted as in 2019	see chapter 4.2.3.3

The acceptance criteria establish requirements for the form of the disposed RAW, including the activity. The prevailing type of container used in the disposal facility are 200 l drums of zinc-plated sheet which are regularly visually inspected at the receiving inspection of the RAW; open-box pallets are used for radioactive waste in form of pieces.

Every receipt of RAW includes evaluation of compliance with activity limits defined in WAC for selected radionuclides.

In 2019 two inspections of RAW management were conducted at the Dukovany disposal facility which concentrated on compliance with the OLCs for safe management of RAW, WAC for disposal and on meeting of requirements set in applicable legislation. One additional inspection was conducted that focused on meeting of requirements for security of NI.

8.6.3.4. RAW Disposal Facility Hostim

The disposal facility was closed based on the performed safety analyses in 1997.

Following activities were performed in 1991 - 1994:

- inventory-taking of the disposed RAW (based on the available records),
- radiation and mining survey inside both the galleries (the information was physically checked that sources and packagings with high activity had been in 1964 moved from the gallery B into the disposal facility Richard),

- hydrogeological evaluation of the location,
- evaluation of potential accident scenarios,
- monitoring system has been created (surface and underground water, geotechnical stability).

Table 8.4 Summary data on RAW Disposal Facility Hostim

Beginning of operation	1959	
End of operation	1964	
Final sealing	1997	
Repository depth under the surface	about 30 m	
	Gallery A	Gallery B
Repository volume	about 360 m ³	1220 m ³
Total volume of disposed RAW	about 1/3 of the gallery	200 m ³
Activity converted as in 1991-1997	see chapter 4.2.3.4	see chapter 4.2.3.4

The performed analyses positively demonstrated that the risks associated with reprocessing and transport of the RAW into another location would be significantly higher than those associated with immobilization of the disposed waste. Therefore the disposal facility has been filled with a concrete mixture and closed. At the moment the disposal facility is in the regime of institutional control, for at least 50 y. The control has not identified any release of radioactive materials from the disposal facility premises into the environment.

8.6.4. ÚJV Řež, a. s.

8.6.4.1. Building 241 - Velké zbytky

SÚJB has issued the following licenses concerning operation of the facility in the Building 241 Velké zbytky:

- License for management of simple and significant sources of ionizing radiation and for use of unsealed radionuclide sources in management of radioactive waste at workplaces of the RAW Management Center from 2014,
- License for operation of workplaces in categories II and III with unsealed sources in the building 241 - Velké zbytky from 2014,
- Licence for RAW management covering collection, segregation, processing, conditioning and storage of RAW (licence authorises also WAC for RAW management in ÚJV Řež, a. s.) from 2019,
- OLCs for safe RAW management from 2019.

Additionally, RAW management in ÚJV Řež, a. s. is regulated by the following internal procedures:

- Organisational chart, Reg. No. RAD 1000 004 (2020),
- Metrological regulation, Reg. No. RAD 1300 003 (2018),
- Onsite emergency plan, Reg. No. PI 1600 016 (2020),
- Monitoring programme of ÚJV Řež, a. s., Reg. No. PI 1600 017 (2019),
- Programme of discharge and environmental monitoring of ÚJV Řež, a. s., Reg. No. PI 1600 035 (2019),
- Safety risks management and prevention system, Reg. No. PI 1600 033 (2018),
- RAW management, Reg. No. PI 2400 023 (2017),
- Radiation protection, Reg. No. SM 1600 025 (2018),
- Registration of radiation sources, Reg. No. PI 1600 027 (2017),

- Emergency preparedness, Reg. No. SM 1600 028 (2018),
- Nuclear safety, Reg. No. SM 1600 029 (2019).

8.6.4.2. Building 211/8 - HAW Storage Facility

SÚJB has issued the following licenses concerning operation of the HAW Storage Facility:

- License for operation of cat. IV workplace – HAW Storage Facility (Building 211/8) from 2017,
- License for nuclear installation operation – HAW Storage Facility (Building 211/8) from 2017,
- Licence to manage nuclear materials from 2018.

A resolution issued by SÚJB has approved the limits and conditions for operation of HAW Storage Facility (Building 211/8).

Management of RAW and ionizing radiation sources

ÚJV Řež, a. s. is a research organization providing engineering and technical service and support, including RAW management. Some activities are contracted by ÚJV Řež, a. s. to entities with necessary qualification.

The system for RAW management includes a sorting process, which has a decisive effect on the efficiency of RAW processing. The sorting process features the following key parameters:

- type of material and outer dimensions,
- nature of contamination:
 - level of contamination,
 - nature (type) of contaminants,
 - nature of contaminants fixation on the surface.

The key parameters for sorting of RAW into groups (classes) determine further processing and selection of suitable methods to process the waste.

Based on the level of activity the RAW is sorted into temporary, low- and intermediate-level waste and HLW (the last mentioned type is not generated in ÚJV).

Further, radioactive waste is sorted based on its nature as follows:

- solid low- and intermediate-level waste, further divided into:
 - compressible,
 - non-compressible,
 - with higher activity, which must be collected in shielding casks due to its activity
- liquid, low- and intermediate active RAW,
 - water based,
 - non-water based (e.g. organic solvents, oils, crude oil products) and their mixtures with water containing tritium,
- special RAW (sealed radionuclide sources, nuclear materials, others).

The criteria for RAW sorting into groups are derived from a method for processing of the waste and from the acceptance criteria for storage and disposal.

RAW is sorted based on the composition of contaminating radionuclides into the following classes:

- waste contaminated with natural radionuclides.
- waste contaminated with artificial radionuclides.

The system for handling with ionizing radiation sources includes assurance of preparedness to respond to radiation extraordinary events. For this purpose an on-site emergency plan has been

developed, Reg. No. PI 1600 016, Revision No. 14, approved by SÚJB and effective since 28 November 2019.

Records of RAW management in ÚJV Řež, a. s. are kept, i.e. quantities and specific activities of radionuclides in the waste. Also operating records are kept and maintained during the RAW management. The data are regularly once a year reported to SÚJB, in agreement with the valid legislation and the concerned SÚJB licenses.

Regulations about keeping and maintenance of the data are specified in the following Management System Programs:

- Management system of RAW Management Centre, Reg. No. PSR 2400 006, Revision No. 03, from 20 September 2019.

In 2019 one inspection of RAW management, including waste from remedy of old environmental liabilities, was conducted in ÚJV Řež, a. s., which were concentrated on compliance with the OLCs for safe RAW management and on compliance with relevant legal requirements. Results of the inspections did not indicate any violations of the above mentioned regulations.

Decommissioning Programs

The following proposals for decommissioning have been developed and approved by SÚJB:

- Proposed decommissioning method for the High-level Waste Storage Facility (Building 211/8), Reg. No. DPP 2400.04, Edition No. 1, Revision No. 0, valid from 26 February, 2016,
- Proposed decommissioning method for workplaces in Building 241 "Velké zbytky" Reg. No. DPP 2400.007, Revision No. 00, of 31 January 2014

8.7. Institutional Measures after Closure

Article 17 of the Joint Convention:

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

- records of the location, design and inventory of that facility required by the regulatory body are preserved;*
- active or passive institutional controls such as monitoring or access restrictions are carried out, if required.*

The Atomic Act defines in Section (§) 25, paragraph 1, among other things, the following obligation for the licensee:

- h) keep and retain a register of sources of ionizing radiation, radioactive waste and nuclear items and forward data from the register to the Office,*

and, according to Section (§) 25, paragraph 2 of the Atomic Act, the implementing legislation establishes, among other things:

- d) the scope, method and period of retaining records on sources of ionizing radiation, radioactive waste and nuclear items and period for forwarding them to the Office.*

SÚRAO operates RAW electronic database system covering RAW transfer for storage and for disposal and updates and maintains records on RAW. Other licensees for RAW management or RAW generators shall keep RAW records to the extent specified in Section (§) 10, paragraph 2 of Decree No. 377/2016 Coll. for at least 10 years after the transfer or disposal of this RAW.

The Atomic Act in Section (§) 107 defines, among other things, conditions to be observed by the Czech Republic to ensure safe and responsible disposal of radioactive waste, including monitoring

of radiation situation in the vicinity of the radioactive waste disposal facility and institutional controls after the radioactive waste disposal facility is closed. The responsibility for monitoring of effects of RAW on the surrounding environment and their institutional control has been given SÚRAO, as provided in Section (§) 113, paragraph 4, letters b) and c) of the Atomic Act.

8.7.1. RAW Disposal Facility Richard

A method to close the disposal facility is provided in the Decommissioning and closure plan of disposal facility Richard, while the last plan was approved by SÚJB in January 2020. It is anticipated that disposal chambers and access tunnels will be filled with a mixture based on cements or clayey sealing material. Institutional control is anticipated for a period of 120 years after the operation is terminated. A monitoring program for a period after the closure has not yet been proposed.

8.7.2. RAW Disposal Facility Bratrství

A method to close the disposal facility is provided in the Proposal of a closure method, while the last proposal was approved by SÚJB in 2013. It is anticipated that disposal rooms and access tunnels will be filled with a mixture based on bentonites or cement. Institutional control is anticipated for a period of 120 years after the operation is terminated. A monitoring program for a period after the closure has not yet been proposed. The Proposal will be reviewed in 2020.

8.7.3. RAW Disposal Facility Dukovany

A method to close the disposal facility is provided in the Decommissioning and closure plan of disposal facility Dukovany, while the last plan was approved by SÚJB in January 2020. Application of layers of sealing materials is anticipated to cover the disposal facility. Institutional control is anticipated for a period of 300 years after the operation is terminated. A monitoring program for a period after the closure has not yet been proposed.

8.7.4. RAW Disposal Facility Hostim

Free space in the disposal facility was sealed in 1997 (filled with concrete) to assure:

- access is prevented to the disposed RAW and the disposal facility premises,
- long-term stabilization of the respective part of the mine work,
- increased efficiency of the existing barriers against penetration by water and potential spreading of contamination into the environment.

The monitoring program includes ten sampling points (underground and surface water) in the disposal facility surroundings.

9. Transboundary Movement - Article 27 of the Joint Convention and Articles 4.2 and 4.4 of the Directive

Article 27 of the Joint Convention:

1. *Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.*

In so doing:

(i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;

(ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;

(iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;

(iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;

(v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. *A Contracting Party shall not license the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.*

3. *Nothing in this Convention prejudices or affects:*

(i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;

(ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;

(iii) the right of a Contracting Party to export its spent fuel for reprocessing;

(iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

Article 4 of the Directive:

2. *Where radioactive waste or spent fuel is shipped for processing or reprocessing to a Member State or a third country, the ultimate responsibility for the safe and responsible disposal of those materials, including any waste as a by-product, shall remain with the Member State or third country from which the radioactive material was shipped.*

4. *Radioactive waste shall be disposed of in the Member State in which it was generated, unless at the time of shipment an agreement, taking into account the criteria established by the Commission in accordance with Article 16(2) of Directive 2006/117/Euratom, has entered into force between the Member State concerned and another Member State or a third country to*

use a disposal facility in one of them.

Prior to a shipment to a third country, the exporting Member State shall inform the Commission of the content of any such agreement and take reasonable measures to be assured that:

- (a) the country of destination has concluded an agreement with the Community covering spent fuel and radioactive waste management or is a party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management ('the Joint Convention');*
- (b) the country of destination has radioactive waste management and disposal programmes with objectives representing a high level of safety equivalent to those established by this Directive; and*
- (c) the disposal facility in the country of destination is authorized for the radioactive waste to be shipped, is operating prior to the shipment, and is managed in accordance with the requirements set down in the radioactive waste management and disposal programme of that country of destination.*

The import of RAW is prohibited by Section (§) 7, paragraph 3 of the Atomic Act : *"It shall be prohibited to import radioactive waste or spent fuel to the Czech Republic or its transfer from a Member State of the Euratom, save in the case of*

- a) re-import of radioactive waste produced during the processing of a material exported from the Czech Republic or re-transfer thereof from a Member State of the Euratom authorized under this Act, or*
- b) import or transfer from a Member State of the Euratom*"

International transport of RAW (i.e. only its reimport, transit or export) is subject to a license by SÚJB under Section (§) 9, paragraph 4 letter d) of the Atomic Act and the method of transport is governed by provisions of Section (§) 143 through Section (§) 148 of the same Act-

The provisions of Section (§) 141 and Section (§) 142 of the Atomic Act establish requirements for transport of radioactive materials in general and are fully compatible with requirements of the Directive of the European Parliament and Council 2008/68/EC of 24 September 2008 on the inland transport of dangerous goods.

The provisions of Sections (§§) 143 through 148 of the Atomic Acts concern only international movements and they are fully compatible with:

- Council Directive 2006/117/EURATOM of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel
- Commission decision 2008/312/Euratom of 5 March 2008 establishing the standard document for the supervision and control of shipments of radioactive waste and spent fuel referred to in Council Directive 2006/117/Euratom.

In 2017 there were two international road transports of RAW from ČEZ, a. s., NPP Dukovany and NPP Temelín to the company Studsvik Nuclear AB, Nyköping, Sweden, with the objective to reduce the volume of metallic RAW by melting and one transport of RAW (generated by previous processing of metallic RAW) back to the Czech Republic.

Further in that year there were six transports of RAW from ČEZ, a. s., NPP Dukovany and NPP Temelín to the company JAVYS, a. s., Jaslovské Bohunice, Slovakia, for RAW minimisation by incineration and super-compaction and one transport of processed RAW back to the Czech Republic.

The transports were performed in agreement with requirements of all countries affected by the transport and with the Directive of the Council 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel. Applicable permits for the transports were issued in the Czech Republic by SÚJB in agreement with the Act No. 18/1997 Coll. and the implementing Decree No. 317/2002 Coll.; the resolution about the transport of radioactive waste to JAVYS, a. s. was conditional on an approval by the respective authority of the Slovak Republic. And the resolution about transport of radioactive waste to Cyclife Sweden AB was issued based on received positive positions from competent authorities of the Federal Republic of Germany, the Kingdom of Sweden and the Kingdom of Denmark.

In 2018 there was one international road transport of RAW from ČEZ, a. s., NPP Dukovany and NPP Temelín to the company EDF Cyclife Nuclear AB, Nyköping, Sweden, with the objective to reduce the volume of metallic RAW by melting.

Further in that year there were seven transports of RAW from ČEZ, a. s., NPP Dukovany and NPP Temelín to the company JAVYS, a. s., Jaslovské Bohunice, Slovakia, for RAW minimisation by incineration and super-compaction and two transports of processed RAW back to the Czech Republic.

The transports were performed in 20' IP-2 or IP-3 ISO containers¹.

The transports were performed in agreement with requirements of all countries affected by the transport and with the Directive of the Council 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel. Applicable permits for the transports were issued in the Czech Republic by SÚJB in agreement with the Act No. 18/1997 Coll. and the implementing Decree No. 317/2002 Coll.; the resolutions were conditional on an approval by the respective authority of the Slovak Republic.

In 2019 there were five international road transports of RAW from ČEZ, a. s., NPP Dukovany and NPP Temelín to the company EDF Cyclife Nuclear AB, Nyköping, Sweden, with the objective to reduce the volume of RAW by incineration and one more transport to melt metallic RAW. One international road transport to ČEZ, a. s., NPP Dukovany of RAW generated by melting process has been conducted as well.

Further in that year there was one transport of RAW from ČEZ, a. s., NPP Dukovany to the company JAVYS, a. s., EBO, Slovakia, for RAW minimisation and one transport of processed RAW back from JAVYS, a. s., EBO, Slovakia to ČEZ, a. s., NPP Dukovany.

The transports were performed in 20' IP-2 ISO containers and were performed in agreement with requirements of all countries affected by the transport and with the Directive of the Council 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel. Applicable permits for the transports were issued in the Czech Republic by SÚJB in agreement with the Act No. 263/2016 Coll. and the implementing Decree No. 379/2016 Coll.; the resolution about the transport of radioactive waste to JAVYS, a. s. was conditional on an approval by the respective authority of the Slovak Republic. And the resolution about transport of radioactive waste to Cyclife Sweden AB was issued based on received positive positions from competent authorities of the Federal Republic of Germany and the Kingdom of Sweden.

¹ According to IAEA safety requirements published in "Regulations for the Safe Transport of Radioactive Material, 2012 Edition, Specific Safety Requirements No. SSR-6", IAEA, Vienna 2012

One international road transport of RAW took place in 2018, from ÚJV Řež, a. s. to NUCLECO S. p. A., Rome, Italy. RAW was transported to the NUCLECO S. p. A. company in order to reduce its volume by super-compaction. The transport was performed in 20 ft ISO containers of IP-2 type.

The transports were performed in agreement with requirements of all countries affected by the transport and with the requirements of Directive of the Council 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel. Applicable permits for the transports were issued in the Czech Republic by SÚJB in agreement with the Act No. 18/1997 Coll. and the implementing Decree No. 317/2002 Coll.; the resolutions were conditional on an approval by the respective authority of Austria and Italy.

In 2019 one international road transport of RAW, from NUCLECO S. p. A., Rome, Italy to ÚJV Řež, a. s. took place. RAW after super-compaction at NUCLECO S. p. A. has been transported back to ÚJV Řež, a. s. and the transport was performed in two 20 ft ISO containers of IP-2 type.

The transports were performed in agreement with requirements of all countries affected by the transport and with the requirements of Directive of the Council 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel. Applicable permits for the transports were issued in the Czech Republic by SÚJB in agreement with the Act No. 263/2016 Coll.

There was no SF transport during the reference period. Details of the experience of cross-border movement of SF from research reactors of ÚJV Řež, a. s. were given in the National Report of the Czech Republic under the Joint Convention, Revision 5.0 of July 2014.

10. Disused Sealed Sources - Article 28 of the Joint Convention

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.
2. A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.

A disused source under Section (§) 60, paragraph 3, letter b) of the Atomic Act means a radionuclide source which is no longer used or intended to be used for the practice for which license was granted by the Office. In that case the licensee holding such a radionuclide source shall immediately hand it over to the supplier, recognized warehouse, licensee for RAW management or to another authorized user (Section (§) 90, paragraph 1 of the Atomic Act).

Section (§) 21, paragraph 1 letter h) of the Atomic Act establishes the obligation of a licensee and registered person to keep and retain a register of sources of ionizing radiation, radioactive waste and nuclear items and to forward data from the register to the Office using a method indicated in the implementing regulation.

Tab. 10.1 Number and radioactivity of disused sealed sources stored in RAW disposal facility Richard

Radionuclide	Number of sources [pcs]	Total activity [GBq]
¹³⁷ Cs	2905	3.47E+05
⁶⁰ Co	4748	1.05E+05
¹⁴ C	1	3.69E-02
²³⁹ Pu	82	6.92E+03
²⁴¹ Am	25628	7.72E+03
⁹⁰ Sr	1026	1.78E+02
²³⁸ Pu	11	3.63E+00
²²⁶ Ra	27	3.61E-01
²⁵² Cf	7	3.35E-04
²² Na	1	5.41E-06
¹²⁹ I	2	1.21E-05
²³⁸ U	14	4.50E+01
²³² Th	1	1.00E-06
⁵⁵ Fe	5	1.36E+01
⁶³ Ni	3	1.24E+00
⁸⁹ Sr	1	0.00E+00
¹³⁴ Cs	1	0.00E+00
Total	34463	4.67E+05

The implementing Decree No. 422/2016 Coll., in Section (§) 39, paragraph 1 and in Annex No. 16 requires additional documents and data about sources of ionizing radiation that are required to be sent to the Office by the licensee in connection with management of sources of ionizing radiation.

Pursuant to Section (§) 25, paragraph 2, letter d) of the Atomic Act and Section (§) 39 of the Decree No. 422/2016 Coll., licensees for management of sources of ionizing radiation are required to send to the Office for the state registration system of sources of ionizing radiation written information about the sources ionizing radiation that they possess, with the exception of a non-significant source of ionizing radiation and a minor source of ionizing radiation whose type was approved by the Office, unless the conditions of the license establish otherwise. The movement of a sealed source is monitored from its manufacture or introduction into distribution until its disposal or storage. The storage option is used only if the sealed source fails to meet acceptance conditions for disposal in a given disposal facility. All costs associated with sealed source management are born by the licensee holding a license for their management, i.e. starting from their takeover to their disposal in a RAW disposal facility. Pursuant to provisions of Section (§) 113, paragraph 4, letter j) of the Atomic Act SÚRAO ensures safe management of nuclear materials or other sources of ionizing radiation that have been found or seized, in accordance with the decision of the Office. Provided the owner of a found source of ionizing radiation is not identified the costs associated with its disposal or storage shall be paid from the state budget.

The described activities are supervised by SÚJB. Stable or portable detectors of ionizing radiation are used to monitor such orphan sources e.g. in metallurgical plants, scrap collecting centers and at border crossings.

To store disused sealed sources, which fail to meet acceptance criteria for disposal in the Richard disposal facility, separate premises in the disposal facility have been dedicated for this type of sources, in the form defined in the acceptance conditions for their storage. Among other conditions, the casks for storage of used sealed sources shall be made of materials the service life of which corresponds to design service life of the cask and the casks shall be leak-tight and easy to handle throughout the storage time.

The Czech legislation enables reimportation of a sealed source in Annex No. 1 to the Atomic Act, Part 2., item f) 3.4 : *“The documentation to be provided where the activity to be licensed is the management of a source of ionizing radiation is as follows: ... in the case of re-import of a source of ionizing radiation, evidence documenting the origin, type, physical properties and chemical composition of the source of ionizing radiation exported outside the territory of the Czech Republic, together with evidence of its use and evidence of overall activity and weight of the source of ionizing radiation”*. At the same time, however, in agreement with the Directive of the Council 2013/59/Euratom, laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation, the export of sources in category 1 (e.g. sealed or unsealed radionuclide source with the ratio of current activity and D-value of 1 000 or greater) and in category 2 (e.g. sealed or unsealed radionuclide source with the ratio of current activity and D-value smaller than 1 000 and equal to or greater than 10) is limited only to states that are capable of continual safe management of such a source.

Further, if a licensee performing an activity during a planned exposure situation or a registered person import or distribute sources of ionizing radiation they shall, on request of the user of the source of ionizing radiation imported or distributed by them, take the source of ionizing radiation back and ensure its safe delivery to the manufacturer or another person authorized for management of the source (Section (§) 68, paragraph 1, letter k) Atomic Act).

Tab. 10.2 Number and radioactivity of disused sealed sources disposed in RAW disposal facility
Richard

Radionuclide	Total activity [GBq]	No. of sources [pcs]	Radionuclide	Total activity [GBq]	No. of sources [pcs]
³ H	4.23E+02	34	⁶⁵ Zn	0.00E+00	24
¹⁴ C	1.20E+01	79	⁶⁷ Ga	0.00E+00	1
⁹⁰ Sr	6.00E+02	2891	⁶⁸ Ge	0.00E+00	14
¹²⁹ I	1.63E-05	6	⁷⁵ Se	7.71E-01	68
¹³⁷ Cs	2.55E+05	2238	⁸⁵ Kr	4.80E+02	224
²³⁸ Pu	2.43E+01	11	⁸⁸ Y	0.00E+00	9
²³⁹ Pu	2.55E+03	33	⁸⁹ Sr	0.00E+00	1
²⁴¹ Am	2.76E+03	4151	⁹⁵ Zr	0.00E+00	9
²¹⁰ Pb	1.85E-01	19	⁹⁹ Mo	0.00E+00	1
²¹⁰ Po	0.00E+00	81	¹⁰⁶ Ru	2.21E-06	22
²²⁶ Ra	9.20E+02	1641	¹⁰⁹ Cd	7.76E-03	79
²²⁸ Th	0.00E+00	1	^{110m} Ag	0.00E+00	1
²³² Th	1.96E+00	1	¹¹³ In	0.00E+00	2
²³⁸ U	5.39E-07	32	¹¹³ Sn	0.00E+00	1
²⁵² Cf	4.17E-03	44	^{119m} Sn	0.00E+00	1
²² Na	6.38E-08	10	¹²⁴ Sb	0.00E+00	4
²⁴ Na	0.00E+00	1	¹²⁵ I	0.00E+00	15
³² P	0.00E+00	3	¹³¹ I	0.00E+00	11
³⁵ S	0.00E+00	3	¹³³ Ba	4.10E-02	27
³⁶ Cl	0.00E+00	1	¹³⁴ Cs	6.00E-04	6
⁴⁰ K	6.92E-07	2	¹³⁹ Ce	0.00E+00	1
⁴⁵ Ca	0.00E+00	12	¹⁴⁴ Ce	0.00E+00	34
⁵¹ Cr	0.00E+00	2	¹⁵² Eu	0.00E+00	268
⁵⁴ Mn	0.00E+00	11	¹⁵³ Gd	6.30E+00	17
⁵⁵ Fe	6.82E+00	64	¹⁷⁰ Tm	0.00E+00	21
⁵⁹ Fe	0.00E+00	34	¹⁹² Ir	0.00E+00	36
⁵⁷ Co	5.89E-06	99	²⁰³ Hg	0.00E+00	852
⁶⁰ Co	5.43E+04	6667	²⁰⁴ Tl	0.00E+00	7
⁶³ Ni	1.44E+00	7	Total	3.17E+05	19971

Tab. 10.3 Number and radioactivity of disused sealed sources disposed in RAW Disposal Facility Bratrství

Radionuclide	No. of sources [pcs]	Total activity [GBq]
¹⁴ C	8	2.99E-01
⁴⁰ K	2	1.80E-05
²²⁶ Ra	6163	1.01E+03
²¹⁰ Pb	10	8.48E-02
²¹⁰ Po	40	1.26E-11
²¹⁰ Po-Be	1	3.46E-09
²³⁵ U	1	5.27E-09
U-nat	40	8.25E-02
²³² Th	2	1.54E-03
Total	6267²	1.01E+03

² A revision of the sources inventory was completed in 2015 based on the accompanying sheets of the former operator of the RAW disposal facility, i.e. the sources received for disposal before the year 2000.

11. General Efforts to Improve Safety

11.1. Nuclear Power Plant Dukovany

The plant will continue with processing of compressible and incinerable RAW and contaminated metal RAW through external foreign contractors (JAVYS, a.s. Jaslovské Bohunice, Slovakia and EdF Cyclife, Sweden).

Removal of radioactive sediments (sludge, borate crystals) from storage tanks for radioactive concentrate will continue. RAW will be conditioned with help of aluminosilicate matrix ALUSIL® at NPP Dukovany.

In connection with the newly effective Act No. 263/2016 Coll. and its implementing regulations, operating and management documents of the licensee for RAW management will be updated.

11.2. Nuclear Power Plant Temelín

The plant will continue with processing of incinerable solid RAW through external foreign supplier (EdF Cyclife Nuclear, Sweden).

The removing of used sorbents from storage tank OTW10B01 will be initiated and the RAW will be conditioned with help of aluminosilicate matrix ALUSIL® at NPP Dukovany.

Radioactive waste from the centrifuge node will be conditioned with help of aluminosilicate matrix ALUSIL® at NPP Dukovany. This work will be performed in campaigns every 1-2 years, based on the actual needs of NPP Temelín.

The occurrence of alpha nuclides and ¹³⁷Cs, as a result of fuel leakage, will be monitored in the individual RAW types and, subsequently, the existing correlation coefficients will be specified.

In connection with the entry into force of the Act no. 263/2016 Coll. and its implementing regulations, operational and management documentation of the license holder for radioactive waste management has been updated.

11.3. ÚJV Řež, a. s.

ÚJV Řež, a. s. has some facilities that were used for RAW management in the past and some of them are no more in operation. Such facilities are a part of old environmental liabilities and have been gradually dismantled (see chapter 8.2.4). These facilities contain RAW from operation and from refurbishment of the nuclear installation or workplaces with ionizing radiation sources accumulated in the past. They are the following facilities:

- building 211/6 - Reloading facility for RAW (the remediation has been completed),
- building 241 - Velké zbytky (RAW management facility), containing technology for processing and conditioning of RAW (the original technology has been remediated),
- storage area for RAW (the remediation has been completed),
- building 211/5 - Decay tanks for RAW (the remediation has been completed).

Within the process of a NI operational licence application the safety analyses and follow-up OLCs were updated for the building 211/8 – HAW Storage Facility. Further, for the purpose of applying for RAW management licence the safety analyses and follow-up OLCs were updated for the building 241 – Velké zbytky, the building 211/6 – Reloading facility for RAW and the building 211/8 – HAW Storage Facility). In connection with the entry into force of the Act no. 263/2016

Coll. and its implementing regulations, operational and management documentation of the RAW management licensee has been updated.

With regard to the planned re-import of HLW coming from the SF reprocessing from the RF and planned transport of SF from LVR-15 research reactor to the storage building 211/8 – HAW Storage Facility, the maintenance of this facility is planned to be done.

Currently, once the remediation has been completed, it is planned to perform maintenance of the building 211/6 – Reloading facility for RAW in order to upgrade the existing leakage barriers restricting the release of radioactive substances into the environment, since it is considered that the facility will be used for the storage of RAW in the future. At the same time the RAW storage capacity increase is in preparation for planned reconstruction of the building 250 – Velká chemie.

Within the RAW Management Centre, an upgrade of the controlled area entrance/exit security system is planned in order to ensure an increased radiation protection and safety level. As part of this modernization it is also planned to strengthen security features for operated facilities.

11.4. SÚRAO

11.4.1. RAW Disposal Facility Richard

As the available disposal capacity of the facility decreases in 2018 comprehensive reconstruction project of underground and surface part of RAW Disposal Facility Richard was prepared. In mid-2019, the work on the first phase of the reconstruction of the underground area has been initiated. The aim of the reconstruction is an adaptation of existing chambers, currently filled with aggregates, to dispose of RAW. The reconstruction has been initiated based on SÚJB licence issued pursuant to Section (§) 9, paragraph 2, letter c) of the Atomic Act and with the permission of the District Mining Office in Most for mining activities, special interference into the earth's crust, under Section (§) 34 of the Act no. 44/1988 Coll. During the disposal facility reconstruction the RAW is still placed into the facility, in campaigns several times per year. The expected date of RAW disposal facility reconstruction finalization is the end of 2021.

The second phase of RAW Disposal Facility Richard reconstruction, which will ensure sufficient disposal capacity until a DGR is under operation, will be initiated after finalization of the first phase of reconstruction. The second phase of the reconstruction will include the modernization of the surface facility for RAW acceptance process.

11.4.2. RAW Disposal Facility Bratrství

Due to the demand for the disposal of this type of RAW, it has been decided to operate the RAW Disposal Facility Bratrství for several more years. Plans to further use of the disposal facility site include primarily stabilization of chambers facing to the back of the access corridor and subsequently, the adaptation of the access corridor for disposal of RAW. Closure of the RAW Disposal Facility Bratrství is expected to be launched after 2025.

11.4.3. RAW Disposal Facility Dukovany

In 2019, the reconstruction of the RAW Disposal Facility Dukovany site fencing has been initiated. Further, the review study of the status of currently empty second double-row of the disposal facility, including a proposal for possible remediation, will be conducted. In the next two

years it is assumed the row D of the disposal facility will be fully filled with RAW and crane will be relocated to the row C of the second double-row of the facility. In 2020, a study on further development of the disposal facility site will be conducted as well. The main concern of the study is the evaluation of the proposal for the construction of the third double-row of in the context of plans to build new NPP units in the Czech Republic.

11.4.4. RAW Disposal Facility Hostim

No further activities are foreseen.

12. Appendices

12.1. List of SF Management Facilities

Tab. 12.1 List of SF Management Facilities

Site	Facility name	Storage capacity [pcs of FA]	Storage capacity [t HM]
Dukovany	SF pool reactor unit 1	699	83
	SF pool reactor unit 2	699	83
	SF pool reactor unit 3	699	83
	SF pool reactor unit 4	699	83
	Interim Spent Fuel Storage Facility	5 040	600
	Spent Fuel Storage Facility	11 172	1340
Temelín	SF pool reactor unit 1	703	396
	SF pool reactor unit 2	703	396
	Spent Fuel Storage Facility	2888	1370
Řež	Annex to HAW Storage Facility (ÚJV)	576	
	SF pool in HAW Storage Facility (ÚJV)	465	
	Wet tank (CV Řež)	60	
	RAW Storage Facility (CV Řež)	80	

12.2. List of RAW Management Facilities

Tab. 12.2 List of RAW Management Facilities

Licensee for RAW management	Facility	Storage/Disposal capacity
EDU	Storage of liquid RAW	
	- RAW concentrate tanks ³	3300 m ³
	- storage tanks for active sorbents ³	300 m ³
	Collection, storage and processing of solid RAW	
	- sorting workplace and storage of solid RAW	800 t
ETE	Storage and processing of liquid RAW (BAPP)	
	- storage tanks for active sorbents	200 m ³
	- storage tanks for radioactive concentrate	520 m ³
	Collection, storage and processing of solid RAW (BAPP)	
	- sorting workplace and storage of solid RAW	500 t
SÚRAO	RAW Disposal Facility Richard⁴	10 250 m ³
	RAW Disposal Facility Bratrství⁵	1 200 m ³
	RAW Disposal Facility Dukovany	55 000 m ³
	RAW Disposal Facility Hostim	1 690 m ³
ÚJV Řež, a. s.	Velké zbytky	
	- storage facility for liquid RAW	112.2 m ³
	- storage facility for solid RAW	173 m ³
	HAW Storage Facility	226.8 m ³
	Reloading site for RAW	1560 m ³

³ the storage capacities are administratively limited

⁴ the total extracted volume is ca 17 050 m³

⁵ the total extracted volume is ca 3 500 m³

12.3. List of Nuclear Installations in the Decommissioning Stage

During the development of this National Report (September 2019) no nuclear installations or other facilities associated with SF management were decommissioned on the Czech Republic's territory.

12.4. Current and Predicted SF Inventory

Article 12 of the Directive:

1. The national programmes shall set out how the Member States intend to implement their national policies referred to in Article 4 for the responsible and safe management of spent fuel and radioactive waste to secure the aims of this Directive, and shall include all of the following:

- c) an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning, clearly indicating the location and amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste;

Tab. 12.3 Inventory as on December 31, 2019

Site	Facility name	Number of stored FAs [pcs]	Weight of stored FAs [t of HM]
Dukovany	SF pool reactor unit 1	602	72
	SF pool reactor unit 2	625	74
	SF pool reactor unit 3	544	65
	SF pool reactor unit 4	535	63
	Interim Spent Fuel Storage Facility	5 040	581
	Spent Fuel Storage Facility	3 612	413
Temelín	SF pool reactor unit 1	432 ⁶	195
	SF pool reactor unit 2	404 ⁷	184
	Spent Fuel Storage Facility	817	395
Řež	Annex to HAW Storage Facility (ÚJV)	0	0
	SF pool in HAW Storage Facility (ÚJV)	0 ⁸	0
	Wet tank (CV Řež)	23 ⁹	
	RAW Storage Facility (CV Řež)	73 ⁸	

⁶ + 25 leaking fuel rods

⁷ + 24 leaking fuel rods

⁸ The box III contains 3.87 kg of natural uranium – irradiated experimental fuel assemblies.

⁹ Fuel type IRT-4M, 19.7 % wt. ²³⁵U

Tab. 12.4 Predicted inventory of SF (in DGR) as provided in draft of updated Policy (2019)

Operational period	EDU 1 - 4 [t HM]	ETE 1, 2 [t HM]	ETE 3,4 + EDU 5 [t HM]	Total [t HM]
40 years	1 740	1 750	---	3 490
60 years	2 430	2 470	5 010	9 910
Operational period	LVR 15 [pcs]			
until 2018	136			
until 2028	286			

It is not expected to increase the amount of LR-0 reactor FAs (now 64 shortened VVER 1000 FAs) and FAs of VR 1 school reactor (now 21 IRT-4M FAs).

12.5. Current and Predicted RAW Inventory

Article 12 of the Directive:

1. The national programmes shall set out how the Member States intend to implement their national policies referred to in Article 4 for the responsible and safe management of spent fuel and radioactive waste to secure the aims of this Directive, and shall include all of the following:

c) an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning, clearly indicating the location and amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste;

Tab. 12.5 Inventory of solid low- and intermediate level RAW as on on December 31, 2019

Licensee for RAW management	Facility	Used storage/disposal capacity
NPP Dukovany	Storage of liquid RAW	804 m ³
	Storage of degraded sorbents	83 m ³
	Collection, storage and processing of solid RAW	261 t (16 t from ETE)
NPP Temelín	Storage of liquid RAW (BAPP)	148 m ³
	Storage of degraded sorbents	67 m ³
	Collection, storage and processing of solid RAW (BAPP)	61 t
SÚRAO	RAW Disposal Facility Richard	8 201 m ³
	RAW Disposal Facility Bratrství	954 m ³
	RAW Disposal Facility Dukovany	12 565 m ³
	RAW Disposal Facility Hostim	330 m ³
ÚJV Řež, a. s.	Velké zbytky	
	- storage facility for liquid RAW	17.5 m ³
	- storage facility for solid RAW	19.2 m ³
	HAW Storage Facility	134.9 m ³
	Reloading site for RAW	0 m ³

For more details see chapter 4.2.

Tab. 12.6 Predicted inventory of RAW as provided in the draft of updated Policy (2019)

Waste category	Waste origin	Volume/weight [m ³ /t]
Low- and intermediate-level waste (meeting WAC of RAW disposal facilities)	<i>Operational RAW from NPPs (to RAW Disposal Facility Dukovany)</i> • 60 y of operational lifetime of existing NPP units • 60 y of operational lifetime of planned NPP units	18 300 m ³ 10 200 – 23 200 m ³
	<i>RAW from NPPs decommissioning (to RAW Disposal Facility Dukovany)</i> • 60 y of operational lifetime of existing NPP units • 60 y of operational lifetime of planned NPP units	10 800 m ³ 7 200 m ³
	<i>Institutional RAW (mainly to RAW Disposal Facility Richard)</i> • operational RAW (60 years) • RAW from historical liabilities and from decommissioning of nuclear installations	2 000 m ³ 1 500 m ³
Intermediate- and high-level waste (not meeting WAC of RAW disposal facilities – to DGR)	<i>Operational RAW</i> 60 y of operational lifetime of existing and planned NPP units	140 t
	<i>RAW from NPPs decommissioning existing and planned NPP units</i>	4 200 t
	<i>Institutional waste:</i> • decommissioning of research reactor • stored at RAW Disposal Facility Richard	20 t 64 t (189 drums)

12.6. Overview of the Czech Legislation on Utilization of Nuclear Energy and Ionizing Radiation and Related Regulations

The following paragraphs contain an overview of valid legal regulations concerning the use of nuclear energy and ionizing radiation.

12.6.1. Atomic Act and Related Acts

- Act No. **263/2016** Coll., Atomic Act,
- Act No. **264/2016** Coll., amending some other acts in connection with adoption of the Atomic Act
- Act No. **249/2000** Coll., to amend Act No. 19/1997 Coll., on some provisions associated with the ban on chemical weapons and on amendments to and alterations of the Act No. 180/2006 Coll. on land planning and building regulations (Building Act), as amended later, of Act No. 455/1991 Coll., on trade licensing (Trade Licensing Act), as amended later and of Act No. 140/1961 Coll., Criminal Act, as amended later - extension of SÚJB competence,
- Act No. **13/2002** Coll., amending the Act on peaceful utilization of nuclear energy and ionizing radiation (Atomic Act) and on amendments to and alterations of some acts, as amended later, Act No. 505/1990 Coll., on metrology, as enacted by Act No. 119/2000 Coll., Act No. 258/2000 Coll., on protection of public health and on alterations in some related acts, as amended later, and Act No. 2/1969 Coll., on establishing of ministries and other central state administration bodies of the Czech Republic, as amended later,
- Act No. **281/2002** Coll., on some provisions associated with the ban on bacteriological (biological) and toxin weapons and on alterations in the Trade Licensing Act - extension of SÚJB competence.

12.6.2. SÚJB Decrees

- Decree No. **422/2016** Coll., on radiation protection and security of radionuclide sources,
- Decree No. **409/2016** Coll., on activities especially important from nuclear safety and radiation protection viewpoint, special professional qualification and training of persons ensuring radiation protection of the registrant,
- Decree No. **408/2016** Coll., on requirements for the management system,
- Decree No. **379/2016** Coll., on type approval of some products in peaceful utilization of nuclear energy and ionizing radiation and transport of radioactive or fissile material
- Decree No. **378/2016** Coll., on siting of nuclear installations,
- Decree No. **377/2016** Coll., on requirements for safe radioactive waste management and on decommissioning of nuclear installations or workplaces of category III or IV,
- Decree No. **376/2016** Coll., on dual-use items in the nuclear area,
- Decree No. **375/2016** Coll., on selected items in the nuclear area,
- Decree No. **374/2016** Coll., on the accountancy and control of nuclear materials and reporting of information on them,
- Decree No. **362/2016** Coll., on the conditions for the award of a grant from the state budget in some existing exposure situations,
- Decree No. **361/2016** Coll., on security of nuclear installations and nuclear material,

- Decree No. **360/2016** Coll., on monitoring of radiation situation
- Decree No. **359/2016** Coll., on details of ensuring radiation extraordinary event management
- Decree No. **358/2016** Coll., on requirements for quality assurance and technical safety and assessment and verification of conformity of selected equipment
- Government Order No. **347/2016** Coll., on the fees for professional activities of the State Office for Nuclear Safety
- Decree No. **21/2017** Coll., on assurance of nuclear safety of nuclear installations,
- Decree No. **162/2017** Coll., on requirements for safety assessment,
- Decree No. **329/2017** Coll., on requirements for a design of a nuclear installation,
- Decree No. **266/2019** Coll., on policy for radioactive waste management and spent fuel management,
- Decree No. **324/1999** Coll., establishing concentration and quantity limits of nuclear materials not subject to provisions about nuclear damages,
- Decree No. **474/2002** Coll., on some measures related to prohibition of bacteriological (biological) and toxin weapons and on amendments to Trades Licensing Act,

12.6.3. Related Documents

- Communication No. **67/1998** Coll., on agreement to the Nuclear Safety Convention,
- Act No. **500/2004** Coll., on administrative procedure (Code of Administrative Procedure), as amended,
- Act No. **44/1988** Coll., on protection and utilization of mineral riches (Mining Act),
- Act No. **255/2012** Coll., on state supervision, as amended later,
- Act No. **634/2004** Coll., on administrative fees, as amended later,
- Act No. **2/1969** Coll., on establishing of ministries and other central state administration bodies of the Czech Republic (as enacted and amended later),
- Act No. **40/2009** Coll., the Criminal Code (as enacted and amended later),
- Act No. **17/1992** Coll., on the environment,
- Act No. **93/2004** Coll., on assessment of impacts of development concepts and programs on the environment,
- Act No. **111/1994** Coll., on road transport, as amended later,
- Decree No. **478/2000** Coll., implementing the Act on road transport, as amended later,
- Act. No. **183/2006** Coll., on town and country planning and building code (Building Act)
- Decree No. **268/2009** Coll., on general technical requirements for construction projects,
- Act No. **123/1998** Coll., on the right for information about the environment, as amended later,
- Decree No. **231/2016** Coll., on collection, preparation and methods of testing of control samples of food and tobacco products,
- Act No. **106/1999** Coll., on free access to information, as amended later,
- Act No. **594/2004** Coll., implementing the regime of the European Communities to control export of goods and technologies of dual use,
- Act No. **22/1997** Coll., on technical requirements for products and on amendments to and alterations of some other acts, as amended later,
- Act No. **228/2005** Coll., on control of trade in products whose possession is regulated in the Czech Republic for security reasons, and on amendments to some other acts
- Government Order No. **1/2000** Coll., on railway shipping rules for public railway freight

transport, as amended later (particularly Section (§) 14 thereof),

- Act No. **268/2014** Coll., on medical devices and on amendments to the Act No 634/2004 Coll., on Administrative Fees, as amended,
- Act No. **124/2000** Coll., to amend Act No. 174/1968 Coll., on state professional supervision of labor safety, as amended later, Act No. 61/1988 Coll., on mining activities, explosives and state mining administration, as amended later, and Act No. 455/1991 Coll., on trade licensing (Trade Licensing Act), as amended later (Section (§) 6, letter b)),
- Act No. **219/2000** Coll., on property of the Czech Republic and its treatment in legal relations, as amended later,
- Decree No. **62/2001** Coll., on national property management by state organizational units and state organizations,
- Act No. **244/2000** Coll., amending Act No. 91/1996 Coll., on animal food (Section (§) 3, paragraph 13),
- Decree No. **282/2005** Coll., regulating sale of medical means (Section (§) 1, paragraph 2, letter e), Section (§) 2, paragraph 1, letter m), paragraph 2, letter i), Appendix to the Decree, letter h),
- Decree No. **409/2005** Coll., on hygienic requirements for products which come to direct contact with water and for products used for water treatment (Section (§) 3),
- Decree No. **432/2003** Coll., defining conditions to classify works into categories, limit levels for biological exposure tests and particulars of reports on works with asbestos and biological agents (Section (§) 4, paragraph 3 and Appendix No. 1, item 6),
- Act No. **100/2001** Coll., on evaluation of impacts in the environment and alterations in some related acts (Act on Evaluation of Impacts on the Environment),
- Act No. **164/2001** Coll., on natural healing sources, sources of natural mineral water, natural healing spas and spa locations and on alterations in some related acts (Spa Act), as amended later – Section (§) 3,
- Government Order No. **361/2007** Coll., establishing conditions for health protection of employees at work,
- Act No. **185/2001** Coll., on waste and alterations in some other acts, as amended later,
- Act No. **258/2000** Coll., on protection of public health and on alterations in some related acts, as amended later,
- Act No. **373/2011** Coll., on specific medical services, as amended,
- Decree No. **250/2020** Coll., on the method of establishing a reserve for the decommissioning of a nuclear installation and category III and category IV workplace.

12.6.4. Crisis Legislation

- Constitutional Act No. **110/1998** Coll., on security of the Czech Republic, as amended by Act No. 300/2000 Coll.,
- Act No. **148/1998** Coll., on protection of confidential facts and alterations in some acts, as amended later,
- Act No. **412/2005** Coll., on the Protection of Classified Information and security capacity,
- Act No. **224/2015** Coll., on prevention of serious accidents caused by selected hazardous chemical substances or chemical mixtures and on changes of the Act No. 634/2004 Coll., on administrative fees, as amended, (Act on Prevention of Serious Accidents)
- Government Order No. **522/2005** Coll., on the list of confidential information,
- Act No. **239/2000** Coll., on Integrated Rescue System and on amendment to certain

related acts, as amended,

- Act No. **240/2000** Coll., on crisis management and on amendment to certain related acts (Crisis Act), as amended,
- Act No. **241/2000** Coll., on economic measures for crisis situations and on amendment to certain related acts, as amended
- Decree by the Ministry of Interior No. **328/2001** Coll., on some details of provision of the integrated rescue system, as amended by the Decree No. 429/2003 Coll.,
- Decree by the Ministry of Interior No. **380/2002** Coll., on the preparation and implementation of civil protection.

12.7. Overview of National and International Safety Documents

An overview of safety documents relating to NPP Dukovany, NPP Temelín, reactor LVR-15 and all individual facilities falling under the regime of the Joint Convention is provided in the National Report of the Czech Republic under the Joint Convention, Revision 2.3 of September 2005, Revision 3.3 of September 2008, Revision 4.0 of March 2011, Revision 4.0 of April 2016 and Revision 6.1 from April 2018. Other documents, not mentioned in the above referred revisions of the National are:

- Update of Calculations of Hydrogeological Transport Inputs for the RAW Disposal Facility Dukovany Safety Analysis, Contractor: ProGeo, s.r.o., 2016
- Geotechnical Monitoring of RAW Disposal Facility Bratrství in 2019, Contractor: GT-IG s.r.o., 2019
- Geotechnical Monitoring of RAW Disposal Facility Richard in 2019, Contractor: GT-IG s.r.o., 2019
- Safety Assessment of RAW Disposal Facility Dukovany, Contractor: SÚRAO, Prague 1, in collaboration with ProGeo s.r.o., update, 2017
- Safety Assessment of RAW Disposal Facility Richard, Final Report, Contractor: Amec Foster Wheeler, ČVUT-FJFI, ENVI-AQUA s.r.o., 2017
- Safety Analysis of RAW Management, Reg. No. PP 2404 362, Rev. No. 00, ÚJV Řež, 2019
- Safety analysis. Licensing Documentation for RAW Management in compliance with Section (§) 9, paragraph 3, letter a) of Atomic Act, Contractor: ČEZ, a.s., update, 2019

12.8. Overview of International Assessment Missions

An overview of reports from international assessment missions which took place from mid-2004 till the end of 2017 at NPP Dukovany, NPP Temelín and SÚJB:

- Follow-up WANO Peer Review 2019 (NPP Dukovany),
- Follow-up IRRS mission 2017 (May 2017, SÚJB; the final report in English: https://www.sujb.cz/fileadmin/sujb/docs/aktualne/IRRS_Follow-up_Czech_Republic_Report.pdf)
- WANO Peer Review 2017 (March /April 2017; NPP Dukovany),
- SALTO mission 2016 (NPP Dukovany),
- IRRS mission 2013 (SÚJB; the final report in English: https://www.sujb.cz/fileadmin/sujb/docs/zpravy/IRRS_Czech_Republic_Final_Report.pdf),
- Follow-up OSART 2013 (NPP Dukovany),
- Follow-up WANO Peer Review 2013 (NPP Temelín),
- Follow-up WANO Peer Review 2012 (NPP Dukovany),

- OSART mission 2012 (NPP Temelín),
- WANO Peer Review 2012 (NPP Dukovany),
- Follow-up SALTO mission 2011 (NPP Dukovany),
- OSART 2011 (NPP Dukovany),
- Follow-up WANO Peer Review 2009 (NPP Dukovany),
- SALTO mission 2008 (NPP Dukovany),
- WANO Peer Review 2007 (NPP Dukovany),
- Follow-up WANO Peer Review 2006 (NPP Temelín),
- WANO Peer Review 2004 (NPP Temelín).