COUNTRY REPORT – CZECH REPUBLIC

NATIONAL REPORT ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT

CONTENTS

List of abbreviations and selected terms

Atomic Act	Act No. 18/1997 Coll., on peaceful utilization of nuclear energy and ionizing radiation and on amendments to and alterations to some acts as amended
BAPP	Auxiliary service building for primary systems (NPP Dukovany)
BPP	Auxiliary building (NPP Temelin)
BRS	National Safety Board (or, the Board)
ČR	Czech Republic
ČSKAE	Czechoslovak Atomic Energy Commission
DGR	Deep geologic repository
EDU	ČEZ, a. s., Nuclear Power Plant Dukovany

EOAR	Equivalent volume activity of radon
ETE	ČEZ, a. s., Nuclear Power Plant Temelin
EU	European Union
FA	Fuel assembly
FDS	Fragmentation and decontamination center
FJFI	Faculty of Nuclear and Physical Engineering, Czech Technical University in Prague
GTRI	Global Threat Reduction Initiative
HK	Hot Chamber
HLW	High-level Waste
HVB	Main Production Unit
II.O.	Secondary Circuit
IAEA	International Atomic Energy Agency
ICRP	International Committee for Radiation Protection
ISFSF	Interim Spent Fuel Storage Facility
INES	International Nuclear Event Scale
IRRT	International Regulatory Review Team
IRS	Incident Reporting System
Joint Convention	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
keff	Effective neutron multiplication coefficient
LVR	Light water reactor
MPO	Ministry of Industry and Trade of the Czech Republic
MV	Ministry of Interior of the Czech Republic
MŽP	Ministry of Environment of the Czech Republic
National Report	National Report of the Czech Republic on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
NI	Nuclear Instalation
NPP	Nuclear Power Plant
PE	Polyethylene
Policy	Radioactive waste and spent fuel management policy in the Czech Republic adopted by the Czech Government Resolution No. 487 of May 15, 2002
PZJ	Quality assurance program
RAW	Radioactive Waste
RF	Russian Federation
RRRFR	Russian Research Reactor Fuel Return
SF	Spent Fuel
SFSF	Spent Fuel Storage Facility
SÚJB	State Office for Nuclear Safety (or, the Office)
SÚJCHBO	State Institute for Nuclear, Chemical and Biological Protection
SÚRAO	Radioactive Waste Repository Authority (or, the Authority)
SÚRO	State Institute for Radiation Protection
SVO	Special water purification system
ŠTK	Transfer cask shaft (or, shaft No. 1 under ČEZ, a. s. terminology)
ÚJF Řež	Nuclear Physics Institute in Řež
ÚJV Řež a. s.	Nuclear Research Institute in Řež a. s.
ÚKŠ	Central Crisis Staff (or, the Staff)
US NRC	United States Nuclear Regulatory Commission
ÚVVVR	Institute for Research, Production and Utilization of Radioisotopes, Prague
VCNP	Civil Emergency Planning Committee (or, the Committee)

VVER Standard identification of light water reactors designed in the former Soviet Union

SUMMARY

On March 25, 1999, the Government of the Czech Republic approved the Joint Convention which came into effect in the Czech Republic on June 18, 2001. In agreement with the obligations resulting from its accession to the Joint Convention, the Czech Republic has compiled already the third National report for the purpose of review meetings of the Contracting Parties, which describes the spent fuel and radioactive waste management system in the the scope required by the specific articles of the Joint Convention. If not stated otherwise, the information presented in the report provides, at the national level, a source of up-to-date and public information (http://www.sujb.cz) on spent fuel and radioactive waste management practices across the facilities subjected to the Join Convention.

The Atomic Act No. 18/1997 Coll. and its implementing decrees form a legislation framework for all spent fuel and radioactive waste management activities and clearly define the responsibilities of license holders for the implemented level of nuclear safety, radiation protection, emergency preparedness and physical protection. The specific activities completed before the end of 2007 ensure that:

- long-term storage of spent fuel from all operated nuclear power plants in the territory of the Czech Republic does and will comply with the adopted government Policy using type-approved dry casks placed in spent fuel storage facilities on NPP Dukovany and NPP Temelin sites,
- spent fuel was transported from research reactors to the Russian Federation for re-processing under the international project "Russian Research Reactor Fuel Return" as part of the "Global Threat
- Reduction Initiative" supported by IAEA and by the US government, • new immobilization technologies are tested and used for the specific categories of operational waste at NPP Temelin, and
- safe storage and disposal of specific categories of operating and institutional low- and intermediate-level waste will continue in near-surface repositories operated by the state organization SÚRAO, established by MPO to provide for activities associated with radioactive waste disposal.

Of the activities scheduled for 2008 – 2012 to improve the safety of spent fuel and radioactive waste management, the following should be noted:

- construction, commissioning and operation of the spent fuel storage facility at NPP Temelin site and the associated type approval of cask for spent fuel transportation and storage,

- testing and application of new technologies for immobilization of operating radioactive sludge and ion exchangers so that the resulting form of radioactive waste can be safely disposed of in the Dukovany repository. These technologies will ensure safe disposal of all categories of operating low- and intermediate-level waste which meet the acceptance criteria for Dukovany repository,

- on-going rehabilitation of environmental liabilities on the site of ÚJV Řež a. s., and

- projects for closing of the selected disposal chambers in the Richard and Bratrství repositories.

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

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

1. INTRODUCTION

To December 31, 2007, several facilities were in operation in the Czech Republic. In addition to power generating units with four reactors VVER 440/213, the site of NPP Dukovany, owned by ČEZ, a. s., also includes the following nuclear installations:

- ISFSF Dukovany – commercial operation since 1997,

- SFSF Dukovany – trial operation since November 2006 and commercial operation since April 2008, and

- RAW repository Dukovany – commercial operation since 1995, owned by the state since 2000.

In addition to standalone nuclear installations the NPP Dukovany site also includes SF pools and ŠTK used to handle SF in each production unit. Similar facilities are also part of NPP Temelin where two reactor units VVER 1000/320 are installed. The construction of a standalone nuclear installation is planned on the site of NPP Temelin – SFSF Temelín. In December 2005, the regulator issued a decision which authorises the siting of this facility and in August 2008 its construction.

SF generated by the operation of the research reactor LVR–15 in ÚJV Řež a. s. may be stored in the SF pool in the reactor hall, in the Building 211/7 – SF storage facility that is a part of the research reactor and in the HLW storage facility, which is classified as independent nuclear instalation in agreement with the Czech law. The other research reactors in ÚJV Řež a. s. (LR–0) and FJFI Prague (VR–1) do not produce any SF due to their small thermal output and limited time of operation.

In addition to RAW repository Dukovany used for disposal of RAW from operation of nuclear power plants and selected categories of institutional RAW, the following disposal systems are at the territory of the Czech Republic:

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

Table 1.1 provides a summary of SF management and management of selected RAW categories in the Czech Republic.

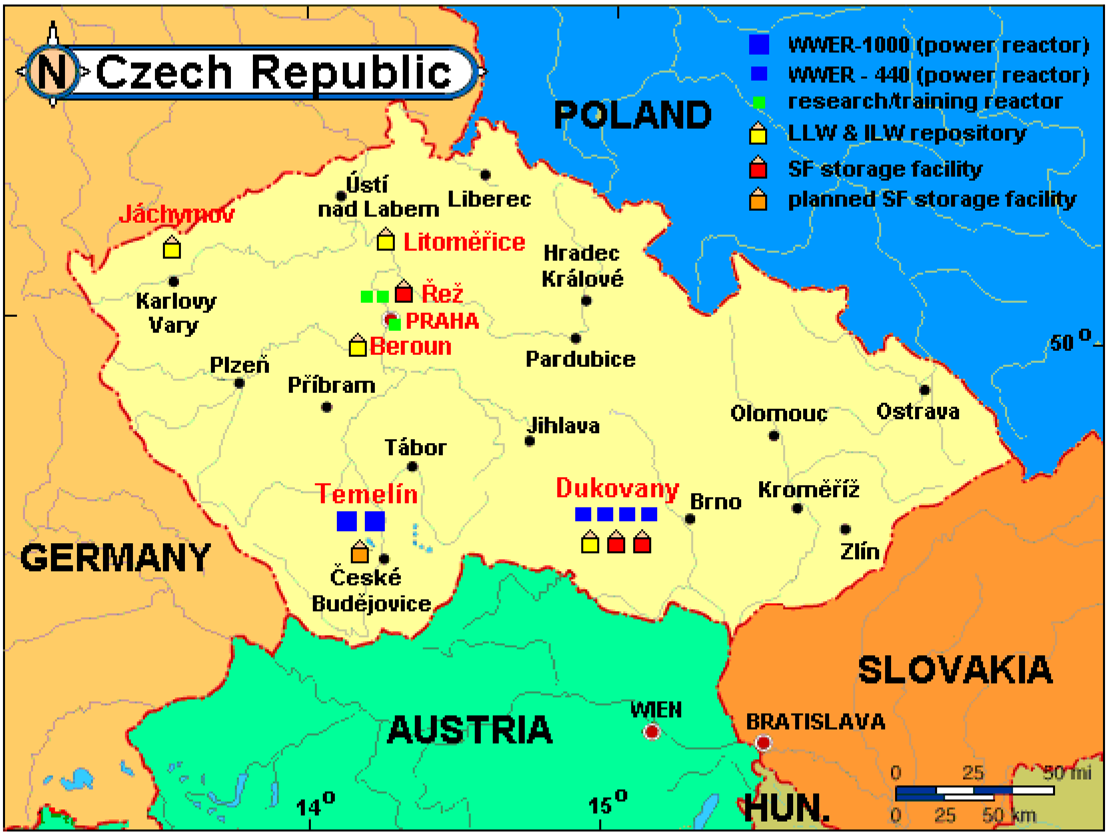


Fig. 1.1 Locations of selected nuclear installations and facilities in the Czech Republic

Table 1.1. Overview of SF management and management of selected categories of RAW

Type of liability	Long term management policy	Funding of liabilities	Current practice/facilities	Planned facilities
Spent fuel	Preferred alternative – direct disposal in DGR (NPP), but other alternatives are not excluded (re-processing, regional repository) + re-processing (SF from research reactors)	Nuclear account	Long-term storage/ISFSF and SFSF Dukovany (SF from NOOs) + re-processing in RF and HLW storage/HLW storage facility (SF from research reactors)	SFSF Temelin and DGR
Nuclear fuel cycle waste	Disposal in operating repositories and in planned DGR	Nuclear account	Disposal in the operating repository (Dukovany) and storage in operating systems (NPPs)	DGR
Institutional waste	Disposal in operating repositories and in planned DGR	Nuclear account	Storage and disposal in operating repositories (Richard, Bratrství, Dukovany) and storage (ÚJV Řež a.s.)	DGR
Decommissioning liabilities	Deferred dismantling (NPP) and immediate dismantling (research reactors and other Nis), RAW will be disposed in Dukovany repository	Decommissioning fund	Periodical review of decommissioning plans; all nuclear installations are currently in operation (NPPs, research reactors, storage facilities)	DGR
Mining and milling waste	Tailing pond rehabilitation	State budget	Recovery of chemical uranium production on the Stráž site and use of tailing ponds on the Rožná site (Dolní Rožínka)	None

2. CATEGORISATION OF RAW AND POLICY FOR RADIOACTIVE WASTE MANAGEMENT AND SPENT FUEL MANAGEMENT

2.1. Categorization of RAW

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“. In accordance with Decree No. 307/2002 Coll., on radiation protection, RAW consist of gaseous, liquid and solid waste. Solid RAW are further divided into three basic categories, that is transient, low- and intermediate- and high-level waste:

- transient waste are waste in which radioactivity after long-term storage (up to 5 years) is lower than clearance levels,

- low- and intermediate-level waste are divided into two sub-groups: short-lived with radionuclide half-life (including 137Cs) less than 30 years and with limited mass activity of long-term alpha nuclides (per cask up to 4000 kBq/kg and the mean value 400 kBq/kg for a total of waste produced in one calendar year), and long-lived waste that are not classified in the short-lived sub-group,

- high-level waste require storage and disposal considering the heat released from decay of radionuclides contained therein.

SF shall not be considered RAW under the Atomic Act unless it has been classified as RAW by its owner, or by SÚJB. SF storage shall be subject to the requirements as RAW before disposal and SF shall be stored in such a way that further treatment is not impeded.

Natural materials produced in the course of mining and treatment of uranium ores are also subject to Act No. 44/1988 Coll., on protection and use of mineral riches (Mining Act), and therefore they are not covered by e.g. the Policy. Their repositories solely contain natural radionuclides and are not considered NIs under the Atomic Act.

2.2. Policy of Radioactive Waste Management and Spent Fuel Management

The Policy adopted by the Czech Government defines the RAW management strategy of the Government and its agencies (waste generated from NIs and workplaces with ionizing radiation sources in healthcare, research and industry) approximately by 2025, with an outlook to the end of the 21st century, with respect to RAW and SF generators. The main principles of the Policy are:

- RAW and SF management in the Czech Republic is the responsibility of authorized private entities and SÚRAO and, if needed, the Authority will also provide extended services for generators,

- long-term disposal of low and intermediate-level short-lived RAW in the Czech Republic lies in their safe disposal in the existing near-surface repositories whose operation has been continuously evaluated and optimized,

- one of disposal alternatives for low- and intermediate-level long-term RAW and HLW is the use of DGR; before its commissioning, these materials will be stored with their generators or in the Authority plants,

- technological procedures for RAW management and preparation to implement DGR in the Czech Republic comply with the legislative requirements and foreign research and technology development results. At the same time, SF re-processing capabilities and the use of new technologies leading to reduction of SF volume and toxicity are being monitored and evaluated,

- costs of activities associated with RAW and SF disposal are paid from the nuclear account, a source funded by RAO and SF generators in agreement with the Atomic Act and the Government Order while the nuclear account as part of the governmental assets and liabilities is managed by the Ministry of Finance. This ensures that disposal costs for waste currently generated will not be transferred to future generations,

- general public is kept informed about the Policy and its fulfillment.

RAW and SF management as described hereinbelow fully complies with the Policy.

3. SCOPE OF APPLICATION

Re-processing of SF originated from operation of power generating reactors in the Czech Republic is not envisaged in the Policy. The use of SF reprocessing technologies is justified if its economic or safety benefits have been proved. The existing prices in the upfront of the fuel cycle, in particular prices of natural uranium, currently make SF re-processing economically unattractive.

From the viewpoint of safety, re-processing does not significantly increase radiation hazard, but in terms of disposal, re-processing or RAW treatment procedures enable separation of long-term and hazardous radionuclides, thus even their optimum treatment before disposal. On the other hand, the DGR design requirements for disposal of HLW from SF re-processing are more challenging than for direct disposal of SF. In the course of development of this Report, SF only from the operating research reactors was sent for re-processing. The preparation and transportation of SF for re-processing was carried out under the international project RRRFR which is part of the joint initiative of the IAEA and US and RF Governments endeavoring to reduce the threat that nuclear materials will be obtained and used by terrorists (GTRI).

The presented National Report provides comprehensive evaluation of the management practices used for all RAW categories, i.e. both operating and institutional RAW management. Chapter 12.9 provides updates on residues after mining and milling of uranium ores. Materials produced during production and treatment of uranium ores is concentrated in pits and tailing ponds.

In accordance with the Atomic Act, nuclear energy may only be used for peaceful purposes in the Czech Republic; 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.

4. INVENTORY AND LIST OF FACILITIES FOR SF AND RAW

4.1. Inventory and Facilities for SF Management

This part of the National Report contains a list and brief description of plants 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 plants:

- NPP Dukovany site – SF pools, ISFSF and SFSF Dukovany,

- NPP Temelin site – SF pools,

- ÚJV Řež a. s. site – SF pool, SF storage facility and HLW storage facility.

4.1.1. Nuclear Power Plant Dukovany

The basic description of NPP Dukovany units, including technical specifications, is provided.

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 m^3, 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 or CASTOR-440/84M type-approved casks for transportation and storage to ISFSF of 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. 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 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 Uncovered SF pool and ŠTK during reactor refueling

As of December 31, 2007, all the four SF pools contained 2372 fuel assemblies with the total weight of heavy metals about 284 000 kg.

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 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 is a standalone facility interlinked to the civil engineering networks of the existing services of 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 where the last 60th CASTOR-440/84 cask was placed in ISFSF Dukovany on March 8, 2006. Consequently, ISFSF Dukovany contains 60 casks CASTOR-440/84 with a total of 5040 FAs on December 31, 2007.

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 casks. The storage capacity of SFSF Dukovany is sufficient to cover all of the SF production of NPP Dukovany until the decommissioning of all four units in NPP Dukovany, after the existing storage capacity of ISFSF Dukovany is exhausted.

SFSF Dukovany is a facility independent of ISFSF Dukovany interlinked to the civil engineering networks of NPP 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 in 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.

Fig. 4.2 Storage hall of ISFSF Dukovany

The storage hall with position indications of each stored cask is provided with a gantry crane of the capacity 130 t. The outside reinforced concrete shielding wall surrounding the storage area of SFSF Dukovany is 4.8 m high and 0.5 m thick.

The storage capacity of SFSF Dukovany is 1340 t of heavy metal in 133 casks. At December 31, 2007, SFSF Dukovany contained 3 CASTOR-440/84M casks with a total of 256 FAs.

4.1.2. Nuclear Power Plant Temelín

The basic description of NPP Temelin units, including technical specifications, is provided.

4.1.2.1. SF Pools

Similar to NPP Dukovany, the main production building of NPP Temelin provides a storage pool immediately next to the reactor cavity for SF removed from the reactor, with the volume of 1440 m^3. The removed SF is stored there for a period of 12 years (during NPP operation), or for at least 5 years (after NPP decommissioning) in a storage pool.

SF pool is laid out in 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 FAs, 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 fuel removal from the whole core.

On December 31, 2007, SF pool at unit 1 of NPP Temelin contained 255 FAs and 13 failed elements and SF pool at unit 2 contained 168 FAs and 18 failed elements with a total weight app. 204 000 kg of heavy metal.

Fig. 4.3 Uncovered SF pool at NPP Temelin

4.1.3. ÚJV Řež a. s.

The basic description of LVR-15 research reactor, including technical specifications, is provided.

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 of thickness 500 mm. 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. In 1996, fuel was removed from the wet accumulator tank and its condition was inspected. Water level and physical and chemical parameters inside the tank are continuously monitored.

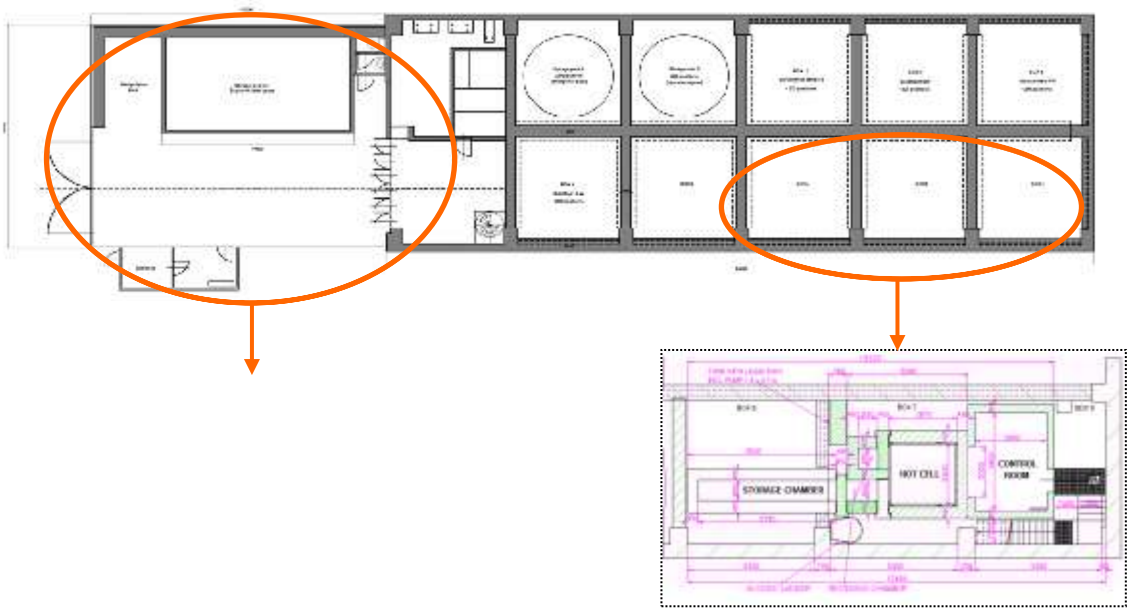
On December 31, 2007 the tank contained 32 FAs of IRT-2M type with the initial enrichment of 36% wt. 235U.

4.1.3.2. Building 211/7 – SF Storage Facility

The building comprises two pools - A and B. For pool A, the internal dimensions are 230 x 120 cm, depth 6 m and for pool B, the dimensions are 440 x 120 cm, depth 6 m. The length as stated includes a 50 cm long handling recess. The pools are constructed with heavy concrete cast between the inner and outer jacket of the 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.

4.1.3.3. Building 211/8 – HLW Storage Facility

The HLW storage facility is designed for storage of SF and solid RAW produced in ÚJV Řež a. s. The facility was built in 1981 – 1988. Consequently, it was modified to comply with SÚJB requirements. The facility construction was completed in 1995. Its trial operation started in 1995 and the facility has been in commercial operation since 1997.



Storage annex

Fig. 4.4 Ground plan of HLW storage facility

As part of rehabilitation efforts to remove the old environmental liabilities and in scope of the preparation for transport of high-enriched SF to the Russian Federation for re-processing (RRRFR project as part of the GTRI initiative declared on May 26, 2004), the HLW storage facility underwent an extensive reconstruction, completed in two stages within 2003 – 2007. Stage 1 was focused to construct a hot chamber, control room and storage instalation (safe) in Boxes VI, VII and VIII of the HLW storage facility. This technology was intended for re-packaging of fuel type EK-10, which had been placed in storage containers of volume 200 l (190 pcs) in Box V and in Pool B of HLW storage facility (16 pcs) in the period 1996 – 2006, to baskets of the newly developed Škoda VPVR/M casks.

In Stage 2 of the reconstruction, a HLW storage facility annex was build for Škoda VPVR/M cask loaded with SF of EK-10 and IRT-2M type and to set up workplaces for loading Škoda VPVR/M casks and for damaged SF management.

Both stages of the reconstruction, including activities performed in the reconstructed parts of the HLW storage facility, were approved by separate SÚJB authorisations. In parallel, Škoda VPVR/M cask of B(U)F and S type was approved on March 23, 2005 for storage and transportation of 36 FAs or hermetically sealed containers with different FAs types of Russian (Soviet) origin.

At the turn of November and December 2007, SF was transported by combined rail and road transport to the Russian Federation according to valid SÚJB authorisation. Thus highly enriched uranium SF of type IRT-2M and low enriched SF of type EK-10, produced in research reactors within 1957 – 2005, was dispatched to the Russian Federation for re-processing. The preparation of transportation and the actual transport was participated by public and private organizations from the Czech Republic, U.S.A., RF, transit countries and the IAEA.

For the above reason, no SF was stored in the HLW storage facility as of December 31, 2007.

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. The RAW management plants are listed according to the individual types of RAW in the chapters below.

4.2.1.1. Solid RAW

Management of solid RAW

- Low-level waste

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 (60 stable collection points 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 > 1mSv/h are collected in shielded boxes at the place of their generation. The collected waste is transported to BAPP,

- measuring and segregation of solid RAW – primary measuring and segregation of solid RAW based on their radioactivity is performed with hand-held devices and a measuring carousel,

- discharge of solid RAW into the environment – the part of solid RAW suitable for discharge into the environment is officially measured to determine the content of radionuclides. The waste meeting criteria of Decree No. 307/2002 Coll. is discharged into the environment or disposed of on the dump for solid municipal waste Petrùvky if not dismissed by SÚJB and subject to compliance with the criterion that "collective effective dose released into the environment may not exceed 1 Sv in any calendar year and effective dose released into the environment may not exceed 10 µSv in any individual,"

- storage of solid RAW – RAW which cannot be discharged into the environment is stored in an organized manner in box pallets with the volume 0.4 m3 or, after low-pressure compacting (15 t) in 200 litters galvanized casks in BAPP storage vaults,

- part of the waste 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 repository, non-generating heat)

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

Equipment for processing of solid RAW

- Low-level RAW

Although the solid RAW management concept formulated in 1980s envisaged a wider range of technologies for solid RAW treatment, the only available now is low-pressure compacting. High-pressure compacting was used as consequent technology to minimize the final volume of solid RAW in 1996 (using a rented high-pressure press). In early 2005, additional equipment was introduced to reduce the volume of solid RAW (waste crusher, cable insulation ripper).

- Intermediate-level RAW

Intermediate-level waste is not treated, only fragmented (if practicable) and stored under control in the storage facility for radioactive items.

Facility 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. Their ceilings are roofed 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 a 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 for 20 stacked folded-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 are 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 101/1A, B101/1, 2. The anticipated storage time is until NPP decommissioning.

4.2.1.2. Liquid RAW

Facility for conditioning 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 bituminisation technology is used for radioactive concentrate treatment into a form acceptable for RAW repository Dukovany. Bitumen-based product is than disposed in RAW repository Dukovany using 200 l galvanized drums. Treatment of radioactive sludge and ion exchangers is under preparation.

Facilities to storage liquid RAW

The system for storage of liquid RAW consists of:

- storage tanks for radioactive concentrate with the total volume 2680 m3 (4x550+460m3) per a double reactor unit,
- emergency tanks for radioactive concentrate with the volume of 460 m3,
- 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 tanks under them to accommodate the whole volume of the stored drums.

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

Table 4.1 Comparison of the actually stored RAW with the operational limits and conditions for storage as at December 31, 2007

Waste type	Maximum allowable storage amount	Actual Storage Amount
Liquid RAW – Active Water Concentrates	4500 m^3	1793 m^3
Liquid RAW – Degraded Sorbents	460 m^3	318 m^3
Solid RAW Total	1000 t	507 t

Treated RAW in drum stored in buildings 809 PS-48 ZRAO	500 drums	40 drums

4.2.1.3. Gaseous RAW

4.2.1.3.1. Equipment to collect gaseous RAW

Gaseous RAW are removed using the venting technology systems (piping, tanks) and ventilation systems (space).

Table 4.2. Effluent Gas Activity

Radionuclide	**Activity A Effective Dose E Use of Annual Limit L**	**Year**	
		2006	**2007**
$^{89+90}$ Sr	A [Bq]	2,664. 10^{4}	2,664. 10^{4}
	E [Sv]	2.10^{-13}	2.10^{-13}
	L [%]	4.10^{-7}	4.10^{-7}
Ra-iodine (^{131}I)	A [Bq]	1,0833. 10^{7}	3,405. 10^{7}
	E [Sv]	$1,45.10^{-11}$	$4,56.10^{-11}$
	L [%]	$3,63.10^{-5}$	$1,141.10^{-4}$
Ra-noble gases	A [Bq]	7,132. 10^{12}	6,322. 10^{12}
	E [Sv]	$1,178.10^{-8}$	$1,092.10^{-8}$
	L [%]	$2,944.10^{-2}$	$2,729.10^{-2}$
Ra-aerosols	A [Bq]	3,283. 10^{7}	4,336. 10^{7}
	E [Sv]	$2,154.10^{-9}$	$2,590.10^{-9}$
	L [%]	$5,384.10^{-3}$	$6,476.10^{-3}$
Tritium (^{3}H)	A [Bq]	6,713. 10^{11}	5,618. 10^{11}
	E [Sv]	$3,491.10^{-10}$	$2,922.10^{-10}$
	L [%]	$8,727.10^{-4}$	$7,304.10^{-4}$
^{14}C	A [Bq]	7,4443. 10^{11}	5,8144. 10^{11}
	E [Sv]	$1,436.10^{-7}$	$1,122.10^{-7}$
	L [%]	0,3592	0,2805
Transuranium Elements	A [Bq]	2,4. 10^{3}	3,16. 10^{3}
	E [Sv]	0,0	0,0
	L [%)	0,0	0,0
Total	D [Sv]	$1,5797.10^{-7}$	$1,2606.10^{-7}$
Total+II.O.	D [Sv]	$1,5797.10^{-7}$	$1,2606.10^{-7}$
Total	L [%]	0,3949	0,3152
Air	[mil.m^{3}]	10602	10277

Gaseous RAW are processed in the venting process systems - gaseous RAW are 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. The gaseous RAW processing creates solid RAW and gas that complies with the requirements for radionuclide release into the environment.

4.2.2. Nuclear Power Plant Temelín

4.2.2.1. Solid RAW

4.2.2.1.1. Management of solid RAW

- Low-level waste

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 as 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 > 1mSv/h are collected in shielded boxes at the place of their generation. 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 with hand-held devices and a measuring carousel,

- discharge of solid RAW into the environment – the part of solid RAW suitable for discharge into the environment is officially measured to determine the content of radionuclides. The waste that complies with the criteria of SÚJB authorisation is released into the environment or disposed on the Temelinec waste dump,

- solid RAW storage – RAW that cannot be released into the environment is stored in an organized manner using PE bags, or using 200 liters galvanized drums in BAPP storage wells after low-pressure compacting (15t),

- part of the waste 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 repository, non-generating heat)

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

4.2.2.1.2. Equipment for processing of solid RAW

- Low-level waste

Although the solid RAW management concept formulated in 1980s envisaged a wider range of technologies for solid RAW treatment, the only available now is low-pressure compacting.

Incineration in an external incinerating plant was used as consequent technology to minimize the final volume of solid RAW in 2007.

The solid RAW treatment plant consists of:

- low-pressure press for solid RAW treatment,
- low-pressure press for pre-treatment of combustible solid RAW,
- low-pressure press for air-conditioning filter elements,
- hydraulic pump,
- shielding containers, and
- box pallets.

- Intermediate-level RAW

Intermediate-level waste are not treated, but only fragmented (if practicable) and kept in controlled RAW stores.

4.2.2.1.3. Facility 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 inside structures and solid RAW are 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 box pallets with solid RAW into the rooms. It is also used to handle transport containers and load solid RAW drums onto transport vehicles. All rooms are currently used for solid RAW storage prior to their transport to RAW repository. The rooms are also used for sludge storage prior to fixation in aluminosilicate matrix. Bitumen product may also be stored here if necessary.

- Intermediate-level solid RAW

Intermediate-level solid RAW are kept in BAPP active storage in rooms C187/1 a C187/2. The rooms contain 32 steel pipes 11.7 m long where active cases are inserted. The storage time is expected until NPP decommissioning.

4.2.2.2. Liquid RAW

Facility for conditioning of liquid RAW

Liquid RAW generated in the process of radioactive liquid cleaning and processing are collected and placed in BAPP storage tanks with the volume of 200, respectively 60 m3.

The bituminisation technology is used for radioactive concentrate treatment into a form acceptable for RAW repository Dukovany. Bitumen-based product is than disposed in RAW repository Dukovany using 200 l galvanized drums.

In 2007, sludge and ion exchanger treatment was started by solidification in aluminosilicate matrix

SIAL® using mobile equipment. Total of 7.4 t sludge with ion exchangers content was treated into the form acceptable for disposal in RAW repository Dukovany.

4.2.2.2.1. Facilities to store liquid RAW

The liquid RAW storage system consists of:

- radioactive concentrate storage tanks with a total volume of 520 m3 (2 x 200m3 + 2 x 60 m3) for both units,
- radioactive concentrate emergency tanks 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 tanks underneath to capture the whole content of storage drums.

Table 4.3 Comparison of stored RAW with the operational limits and conditions for storage as at December 31, 2007

Waste type	Maximum allowable storage amount	Actual Storage Amount
Liquid RAW – Active Water Concentrates	520 m^3	309 m^3
Liquid RAW – Degraded Sorbents	200 m^3	0 m^3
Solid RAW Total	500 t	119 t
Treated RAW in drum stored in C197	10 m^3	2,6 m^3

The gaseous RAW processing philosophy is rather simple and lies in separation of radioactive materials from contaminated air through filtration. The following tables provide effluent gas activity data, effective doses received by an individual in the critical group of the population and radionuclide group rates of the used effluent limit for the period from January 1, 2006 to December 31, 2007.

Table 4.4 Activity of gaseous effluents

Radionuclide	Aktivity/Effective Dose	Year	
		2006	**2007**
$^{89+90}$ Sr	A [kBq]	0,00	0,00
	E [µSv]	0,00	0,00
RI	A [MBq]	172,6675	241,6583
	E [µSv]	0,0002	0,0003
Noble Gases	A [GBq]	7703,5095	8910,1179
	E [µSv]	0,0298	0.0519

Aerosols	A [kBq]	7031,6382	6379,7199
	E [μSv]	0,0003	0,0002
Tritium	A [GBq]	1615,8031	3693,4114
	E [μSv]	0,0082	0,01866
^{14}C	A [GBq]	560,9187	503,7217
	E [μSv]	1,0377	0,9319
Transuranium Elements	A [kBq]	43,4013	16,1024
	E [μSv]	0,0004	0,0000
Total	**D [μSv]**	**1,0764**	**0,9923**
Total+II.O.	**D [μSv]**	**1,0764**	**0,9923**
Air	[mil.m^3]	5705,3393	5833,3960

The specified limit is the authorized effective dose limit of exposure and the effective dose rate per individual in the critical group of the population set up for NPP Temelin at 40 µSv/year by SÚJB authorisation. This limit is based on the optimizing limit set forth in Section 56 of Decree No. 307/2002 Coll. (200 µSv for effluent gas from nuclear power installations).

Table 4.5 Contribution of different radionuclide groups to total annual effluent limit

Radionuclide	**Year**	
	2006	**2007**
$^{89+90}$ Sr	0,0000 %	0,0000 %
RI	0,0005 %	0,0007 %
Noble Gase	0,0744 %	0,1297 %
Aerosols	0,0005 %	0,0005 %
Tritium	0,0204%	0,0466 %
^{14}C	2,5942 %	2,3297 %
Transuranium Elements	0,0010 %	0,0000 %
Total	**2,6911 %**	**2,5072 %**
Total+II.O.	**2,6911%**	**2,5072 %**

4.2.3. SÚRAO

4.2.3.1. RAW Repository Richard

This repository is used to mainly dispose institutional RAW containing artificial radionuclides. Separately from disposed RAW, there are also RAW that cannot be currently disposed and wait to be disposed in a respective repository. They mainly include sealed radionuclide sources, collected radionuclide sources from fire detectors and nuclear materials.

Table 4.6 Inventory of RAW disposed in the Richard repository as at December 31, 2007

Radionuclide	Total Activity [Bq]
^{3}H	$4{,}54.10^{13}$
^{14}C	$8{,}20.10^{12}$
^{36}Cl	$8{,}90.10^{9}$
^{90}Sr	$2{,}58.10^{13}$
^{99}Tc	$8{,}35.10^{7}$
^{129}I	$4{,}94.10^{6}$
^{137}Cs	$5{,}05.10^{14}$
Total activity of long-term α radionuclides	**$1{,}52.10^{13}$**

Table 4.7 Inventory of RAW stored in the Richard repository as at December 31, 2007

Radionuclide	Total Activity [Bq]
^{137}Cs	$2{,}84.10^{14}$
^{60}Co	$4{,}60.10^{14}$
^{241}Am	$6{,}36.10^{12}$
^{239}Pu	$3{,}41.10^{12}$
^{238}Pu	$1{,}14.10^{11}$
^{238}U	$1{,}40.10^{10}$
^{226}Ra	$3{,}65.10^{08}$
^{235}U	$4{,}00.10^{05}$
Total activity of long-term α radionuclides	**$9{,}90.10^{12}$**

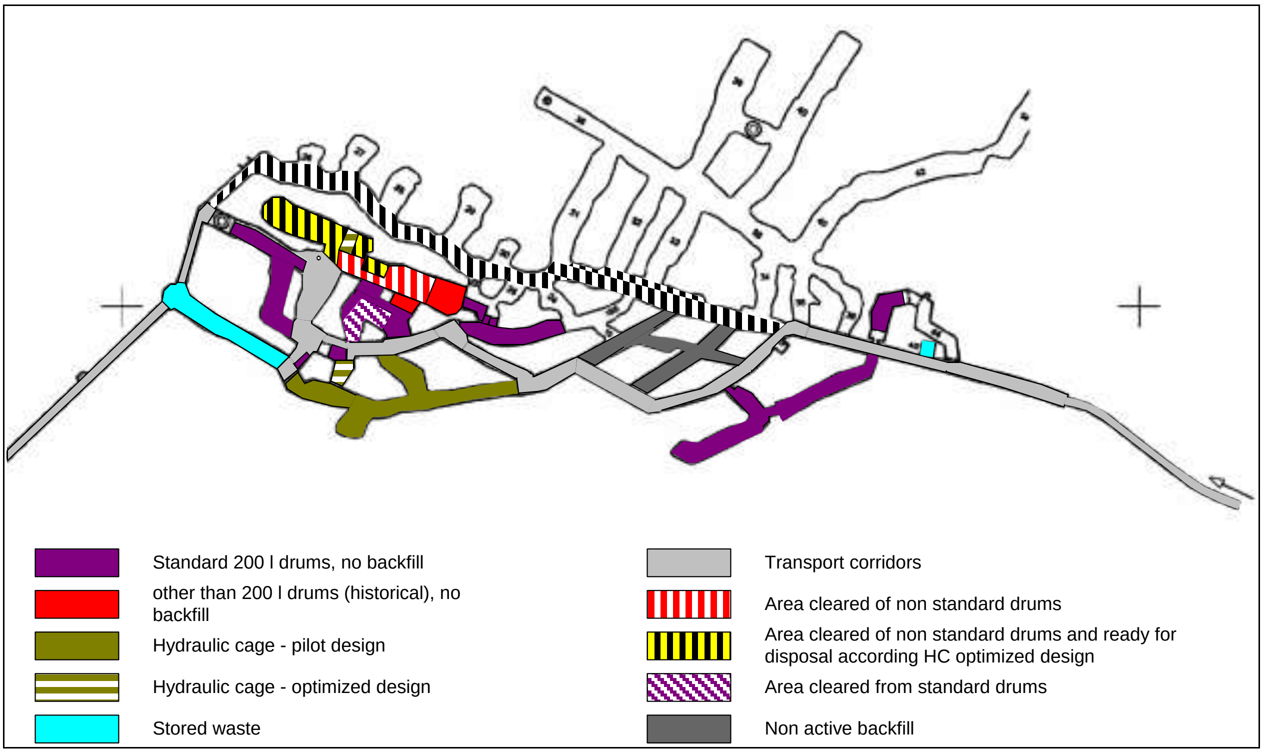


Fig. 4.6 RAW repository Richard – layout

4.2.3.2. RAW Repository Bratrství

The repository is used to dispose RAW containing natural radionuclides.

Table 4.8 RAW repository Bratrství Inventory at December 31, 2007

Radionuclide	**Total Activity**
^{226}Ra	$1{,}33.10^{12}$ Bq
U	$4{,}11.10^{11}$ Bq
^{232}Th	$1{,}34.10^{8}$ Bq

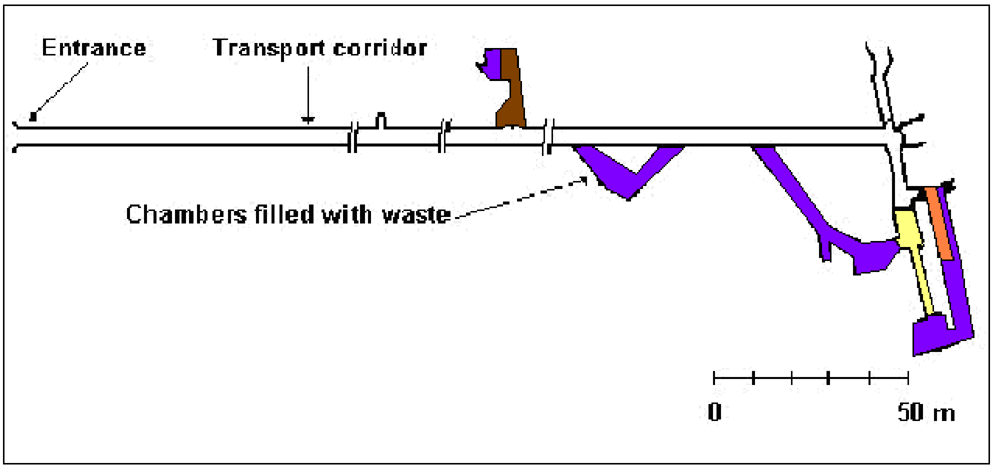


Fig. 4.7 RAW Repository Bratrství – layout

4.2.3.3. RAW Repository Dukovany

The repository is used to dispose short-lived low-level waste from both the nuclear power plants in the Czech territory, and limited amount of institutional RAW.

Table 4.9 Inventory of RAW repository Dukovany as at December 31, 2007

Radionuclide	Total Activity [Bq]	Radionuclide	Total Activity [Bq]
^{14}C	$7{,}36.10^{10}$	**^{99}Tc**	$1{,}23.10^{9}$
^{41}Ca	$3{,}43.10^{8}$	**^{129}I**	$4{,}32.10^{8}$
^{59}Ni	$2{,}19.10^{9}$	**^{137}Cs**	$2{,}13.10^{12}$
^{63}Ni	$1{,}44.10^{11}$	**^{239}Pu**	$4{,}30.10^{6}$
^{90}Sr	$3{,}16.10^{9}$	**^{241}Am**	$1{,}58.10^{8}$
^{94}Nb	$1{,}23.10^{9}$		

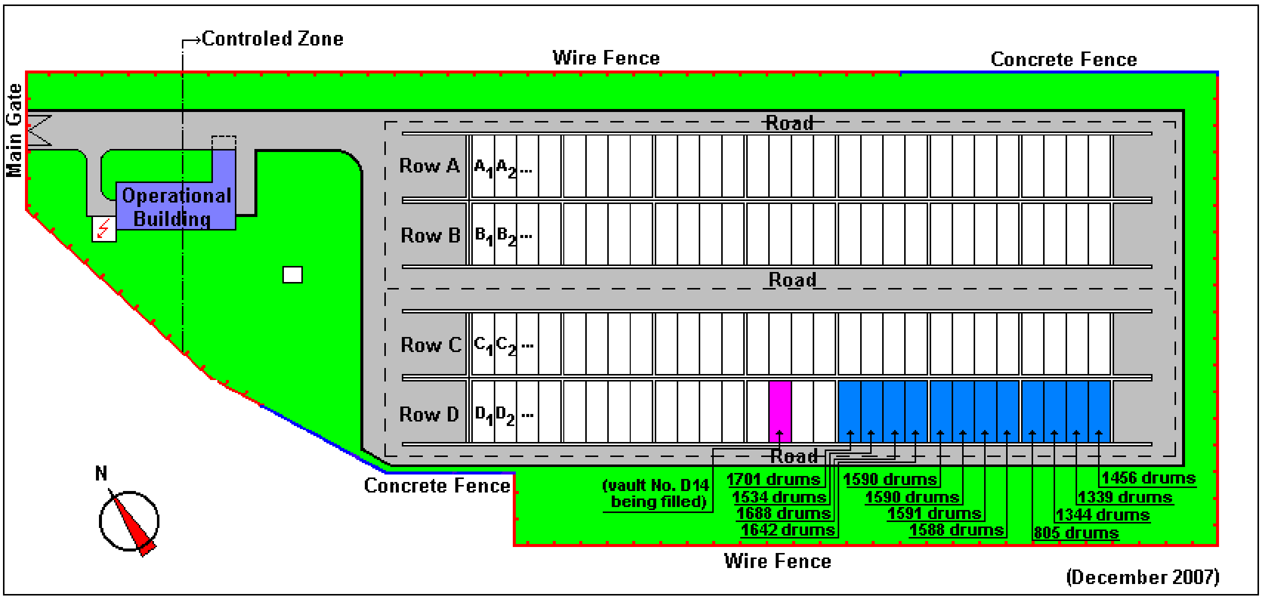


Fig. 4.8 Layout and current filling (occupation) of the disposal units in RAW repository Dukovany as at December 31, 2007

4.2.3.4. RAW Repository Hostim

The repository 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 4.10 below was calculated in 1991.

Table 4.10 Inventory of RAW repository Hostim – activity re-calculation in 1991

Radionuclide	**Total Activity** [Bq]	
	Gallery A	**Gallery B**
^{3}H	Estimate: Gallery A. equivalent max. 10^{10} Bq (the range of radionuclides produced in the former ÚJF)	$1{,}0.10^{11}$
^{14}C		$2{,}0.10^{10}$
^{137}Cs		$1{,}3.10^{10}$
^{90}Sr		$1{,}3.10^{10}$
^{60}Co		$5{,}8.10^{8}$
^{226}Ra		$3{,}3.10^{7}$
^{63}Ni		$1{,}9.10^{6}$
^{204}Tl		$1{,}5.10^{6}$
^{147}Pm		$1{,}1.10^{5}$
Total Activity	max. 10^{10}	cca 10^{11}
Total Activity	$< 10^{11}$	

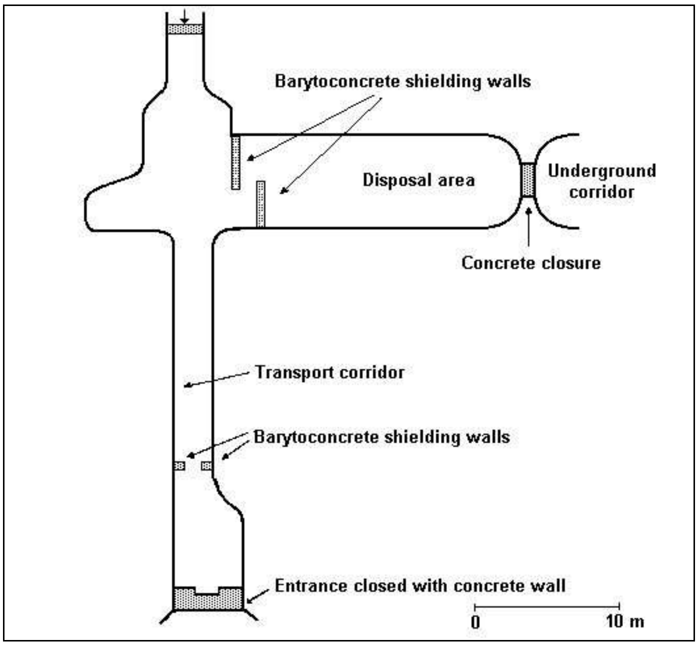


Fig. 4.9 RAW repository Hostim – layout

4.2.4. ÚJV Řež a. s.

4.2.4.1. Building 241 - Velké zbytky - RAW Management Facility

The facility is used to store RAW before treatment and RAW after conditioning before the transport for disposal. The maximum volume of low and intermediate-level waste stored before processing is 163 m3 (liquid RAW) and 23 m3 (solid RAW). The maximum volume of conditioned RAW stored in the building is 26 m^3.

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

Table 4.11 Low and intermediate-level solid RAW amount in building 211/6

Box No.	RAW Volume [m^3]
Box 1	50
Box 2	50
Box 3	40
Box 4	140
Box 5	3,24
Box 6	1
Box 7	28
Box 8	70
Total	**382,2**

The estimated total activity of RAW storage is: 100 GBq (RAW) and 3 TBq (spent sealed sources), with the prevailing radionuclides ^{60}Co, ^{90}Sr, ^{137}Cs.

4.2.4.3. Building 211/8 - HLW Storage Facility

Table 4.12 Low and intermediate-level waste volume

Box No.	RAW Volume [m^3]
Box I	0,02
Box II	2,4
Box IV	2,8
Total	**5,22**

The estimated total activity of RAW stored is 1.87 MBq (isotopes $^{235,\ 238}U$), 30.29 GBq (^{239}Pu), 7.7 TBq (activation products, in particular ^{60}Co).

Table 4.13 SF inventory

Spent Fuel	Qty	Location	Estimated Activity	Prevailing Radionuclides
No SF in the HLW storage facility at December 31, 2007				

4.2.4.4. Storage Area for RAW Červená skála

Table 4.14 Low and intermediate-level waste amounts

Location	Quantity [pcs]	RAW Volume [m^3]
ISO containers	6	120
Collection tanks in Building 261	2	20
Sand filter tanks in Building 241	5	20
Collecting tanks 9A, 9B, 9C in Bldg. 241	3	30
Exchangers in Building 241	2	4
Tanks B and C in Building 241	2	4
Total	**20**	**198**

The estimated total activity of RAW storage is 10 GBq, the prevailing radionuclides are ^{60}Co, ^{90}Sr, ^{137}Cs.

4.2.4.5. Decay Tank for RAW, Building 211/5

Table 4.15 RAW storage amounts in decay tanks

Location	RAW Volume [m^3]	
	Liquid RAW	**Solid RAW**
Pool A	4,5	0
Pool B	8	3
Total	**12,5**	**3**

The estimated total activity of RAW storage in decay tanks, Building 211/5, is 50.2 TBq. The prevailing radionuclides are ^{60}Co and fission products (in particular ^{90}Sr, ^{137}Cs).

5. LEGISLATIVE AND REGULATORY SYSTEM

5.1. Legislation and Regulatory Framework

The legislative and regulatory framework shall provide for:

- the establishment of applicable national safety requirements and regulations for radiationsafety;
- a system of licensing of spent fuel and radioactive waste management activities;
- a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a license;
- a system of appropriate institutional control, regulatory inspection and documentation and reporting;
- the enforcement of applicable regulations and of the terms of the licenses;
- a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.

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

The Act No. 18/1997 Coll. as amended later (Atomic Act) defines conditions for peaceful utilization of nuclear energy and ionizing radiation, including activities requiring a license from SÚJB. The Atomic Act is followed-up by the following decrees:

- SÚJB Decree No. 144/1997 Coll., on physical protection of nuclear materials and nuclear installations and their classification,
- SÚJB Decree No. 145/1997 Coll., on accounting for and control of nuclear materials and their detailed specification, as amended by Decree No. 316/2002 Coll.,
- SÚJB Decree No. 146/1997 Coll., specifying activities directly affecting nuclear safety and activities especially important from radiation protection viewpoint, on requirements for qualification and professional training, on methods for verification of special professional competence and issue of authorizations to selected personnel, and the form of documentation to be approved for licensing of training of selected personnel, as amended by Decree No. 315/2002 Coll.,
- SÚJB Decree No. 179/2002 Coll., establishing a list of selected items and items of dual use in the nuclear area,

- SÚJB Decree No. 307/2002 Coll., on radiation protection, as amended by Decree No. 499/2005 Coll.
- SÚJB Decree No. 132/2008 Coll., on quality assurance in activities associated with nuclear energy use and radiation practices and on establishing criteria for classification and categorization of classified equipment into safety classes,
- SÚJB Decree No. 215/1997 Coll., on criteria for siting of nuclear installations and very significant sources of ionizing radiation,
- SÚJB Decree No. 318/2002 Coll., on details for assurance of emergency preparedness at nuclear installations and workplaces with sources of ionizing radiation and on requirements for the content of on-site emergency plans and of emergency rules, as amended by Decree No. 2/2004 Coll.,
- SÚJB Decree No. 106/1998 Coll., on nuclear safety assurance of nuclear installations during their commissioning and operation,
- Decree SÚJB No. 195/1999 Coll., on requirements for nuclear installations to assure nuclear safety, radiation protection and emergency preparedness,
- Decrees SÚJB No. 185/2003 Coll., on decommissioning of nuclear installations and workplaces in categories III and IV,
- Decree SÚJB No. 324/1999 Coll., establishing concentration and quantity limits of nuclear materials not subject to provisions about nuclear damages.
- Decree No. 317/2002 Coll., on type-approval of packagings for transport, storage and disposal of nuclear materials and radioactive substances, on type-approval of ionizing radiation sources and transport of nuclear materials and specified radioactive substances
- Decree No. 319/2002 Coll., on function and organization of the national radiation monitoring network,
- Decree No. 419/2002 Coll., on personal radiation passes.
- Decree No. 107/2003 Coll. by the Ministry of Finance, on involvement of regional offices in allocation of subsidies to identify risks resulting from presence of radon and its daughter isotopes in the interior atmosphere of buildings and in water used for public supply and in adoption of related measures,
- Decree No. 360/2002 Coll., by MPO, establishing a method to create a provision for decommissioning of nuclear installations and workplaces in categories III or IV,
- Government Order No. 46/2005 Coll., to alter the Government Order No. 416/2002 Coll., establishing amounts of allocations and method of their payment by generators RAW to the nuclear account and amounts of annual contributions to municipalities and rules for their provision,
- Government Order No. 11/1999 Coll., on emergency planning zone.

The requirements for RAW management (RAW from nuclear installations and institutional RAW) are defined in the Atomic Act (Sections 24-31) and in Decree No. 307/2002 Coll.

The adoption of the so-called "crisis legislation" represented a major step in the legislative efforts. It includes the following acts, government orders and decrees:

- Act No. 239/2000 Coll., on the Integrated Rescue System and alterations in some acts,
- Act No. 240/2000 Coll., on crisis management and alterations in some acts (Crisis Act),
- Act No. 241/2000 Coll., on economic measures for crisis conditions and alterations in some acts.
- Constitutional Act No. 110/1998 Coll., on Czech Republic safety, as amended by Act No. 300/2000 Coll.,
- Act No. 353/1999 Coll., on prevention of serious accidents caused by selected dangerous chemical materials and chemical preparations and on alteration of Act No. 425/1990 Coll., as amended later
- Government Order No. 246/1998 Coll., defining lists of confidential facts, as amended later.
- Act No. 148/1998 Coll., on protection of confidential facts and alterations in some acts, as amended later.
- Decree No. 328/2001 Coll., on some details of integrated rescue system assurance, as amended by Decree No. 429/2003 Coll.
- Decree No. 474/2002 Coll., on some measures related to prohibition of bacteriological (biological) and toxin weapons and on amendments to Trades Licensing Act,
- Decree No. 193/2005 Coll., on establishment of the list of theory and practical areas contained in education and training required in the Czech Republic for the performance of regulated activities in the scope of competency of the State Office for Nuclear Safety,
- Decree No. 309/2005 Coll., on technical safety assurance for some nuclear installations, and
- Decree No. 462/2005 Coll., on distribution and collection of dosimeters for survey of buildings with elevated level of natural exposure and criteria for remediation grants.

The requirements RAW management (RAW from NIs and institutional RAW) are defined in the Atomic Act (Sections 24-31) and in Decree No. 307/2002 Coll. (Sections 46-55).

The adoption of so-called "crisis legislation" represented a major step in the legislative efforts. These legal rules govern one of the areas directly associated with nuclear safety in a manner compatible with the EU law.

In connection with the preparation of the country to join the EU and with the objective to enable the implementation of the obligations resulting from new international treaties, the Parliament of the Czech Republic amended the Atomic Act with Act No. 13/2002 Coll. The amendments mainly concern the provisions dealing with radiation protection in order to ensure compatibility with the relevant European directives, and the provisions dealing with safeguards that accept a Supplementary Protocol to the Nuclear Weapons Non-Proliferation Treaty.

The full text of the Atomic Act and its implementing regulations are available on the SÚJB website (http://www.sujb.cz).

The Czech legislation in the given area includes, by means of reference in the Atomic Act and other regulations, the international treaties acceded by the Czech Republic (or by the former ČSSR and later ČSFR).

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 the following bilateral agreements entered by the Czech Republic, or its predecessors.

5.1.2. Approval Process, Inspections and Enforcement of Compliance

The fundamental law governing the licensing and approval process for nuclear installations lies in the Construction Act (No. 183/2006 Coll.) and the Atomic Act. Other important regulations in this legal area include Act No. 500/2004 Coll., the Code of Administrative Procedure, Act No. 552/1991 Coll., on state control, Act No. 244/1992 Coll., on assessment of impacts of development concepts and programs on the environment, Act No. 100/2001 Coll., on assessment of impacts on the environment, and Act No. 106/1999 Coll., on free access to information, and the associated legal regulations with lower legal force, as ammended by Act No. 61/2006 Coll.

From the viewpoint of the Construction Act, there are four fundamental licenses for any construction with a nuclear installation, i.e. sitting licence, construction licence, operation license and decommissioning licence, within the competence of local authorities, specifically the locally relevant construction department. Provided the proceedings involve interests protected by special regulations, such as nuclear safety or radiation protection, the building department shall decide in agreement with or based on a permit from relevant state administration bodies which defend such interests. The relevant state administration body may make its permit conditional upon meeting of conditions specified in its decision issued in agreement with a special act that authorizes the body to do so.

The Atomic Act specifies activities requiring a license from SÚJB. Apart from the zoning and planning decision, building permit and approval to operate, many other activities require the approval e.g. individual stages of nuclear installation commissioning, refurbishment or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness, discharge of radionuclides into the environment etc. More detailed information is provided in the respective chapters hereof.

Act No. 17/1992 Coll., on the environment, as amended and supplemented later, Act No. 244/1992 Coll., on assessment of impacts of development concepts and programs on the environment and, particularly, Act No. 100/2001 Coll., on assessment of impacts on the environment and alterations in some related acts (Act on Assessment of Impacts on the Environment), require assessment of construction projects from the viewpoint of their impact on the environment (the so-called „Environmental Impact Assessment“) in a special procedure with a potential involvement of the public. The act establishes a right for the public – citizens- to attend related public hearings and to express their comments on the concerned construction. The public may be also represented by a concerned municipality, which is a party to the proceedings under the law, or by registered civil initiatives. The state administration body in charge of a decision about the impact of a nuclear power plant construction on the environment is the Ministry of the

Environment. SÚJB supervising activities are regulated in more detail by Section 39 of the Atomic Act and by Act No. 552/1991 Coll., on state control as amended.

Remedial measures to meet legislative requirements are specified in Sections 40 and 41 of the Atomic Act and include the SÚJB power to require redress, to order performance of technical reviews, inspections and tests of operational condition of the installation, power to withdraw an authorization of special professional competence from the nuclear installation personnel in case they violate their obligations and power to impose fines for failure to met the obligations specified in the Atomic Act. In case of danger in delay SÚJB shall be entitled to order to reduce the output of or stop operation of a nuclear installation. Section 16 of the Atomic Act, and particularly its paragraph 4, deals with alteration, cancellation and cessation of a license, which entitles SÚJB to reduce or suspend the licensed activity, provided the licensee violates his obligations.

5.2. Regulatory Bodies

5.2.1. Mandate and Competence of the Regulatory Body

The SÚJB competence is currently defined in the Atomic Act, Section 3 which states the following:

(1) State administration and supervision of the utilization of nuclear energy and ionizing radiation and in the field of radiation protection shall be performed by the State Office for Nuclear Safety (hereafter referred to as "the Office").

(2) The Office

a) shall carry out state supervision of nuclear safety, nuclear items, physical protection, radiation protection and emergency preparedness and shall inspect the adherence to the fulfillment of the obligations arising out of this Act;

b) shall monitor non-proliferation of nuclear weapons and carry out state supervision of nuclear items and physical protection of nuclear materials and nuclear installations;

c) shall issue licenses to perform practices governed by this Act and shall issue type-approvals for packaging assemblies for transport and storage of nuclear materials and radioactive substances given in an implementing legal regulation, ionizing radiation sources and other products;

d) shall issue authorizations for activities performed by selected personnel;

e) shall approve documentation, programs, lists, limits, conditions, methods of physical protection assurance, emergency rules and, subject to discussion with the relevant District Authority of compatibility with off-site emergency plans, on-site emergency plans and their modifications;

f) shall establish conditions, requirements, limits, maximum permitted levels, maximum permitted levels of radioactive contamination of foodstuffs, guidance levels, dose constraint, reference levels, diagnostic reference levels, exemption levels and clearance levels;

g) shall establish the emergency planning zone and, if applicable, its further structuring, and shall approve delineation of the controlled area;

h) in accordance with an implementing legal regulation, shall establish requirements on emergency preparedness of licensees, and shall inspect their fulfillment;

i) shall monitor and assess the exposure status and regulate exposure of individuals;

j) shall issue, register and verify personal radiation passport; related details shall be set out in an implementing legal regulation;

k) shall provide information to municipalities and District Authorities concerning radioactive waste management within their territory of administration;

l) shall control the activity of the National Radiation Monitoring Network, the functions and organization of which shall be set out in an implementing legal regulation, shall provide for the functioning of its head-office, and shall provide for the activities of an Emergency Response Center and for an international exchange of information on the radiation situation;

m) shall establish State and Professional examination commissions for verification of special professional competence of selected personnel, and shall issue statutes for these commissions and specify activities directly affecting nuclear safety and activities especially important from the radiation protection viewpoint;

n) shall maintain a State system of accounting for and control of nuclear materials and data and information in accordance with international agreements binding on the Czech Republic, and shall set out requirements for accounting methods and inspection thereof in an implementing legal regulation;

o) shall maintain a national system for registration of licensees, registrants, imported and exported selected items, ionizing radiation sources, and a record of exposure of individuals;

p) shall ensure, by means of the National Radiation Monitoring Network and based on assessment of a radiation situation, the availability of background information necessary to take decisions aimed at reducing or averting exposure in the case of a radiation accident;

q) shall approve a classification of nuclear installation or its components and nuclear materials into appropriate categories, from the physical protection viewpoint;

r) shall perform the function of the national authority for an international verification of a comprehensive ban of nuclear tests;

s) shall ensure international co-operation within its sphere of competence and, in particular, shall be an intermediary of technical co-operation with the International Atomic Energy Agency, and within its sphere of competence shall communicate information to the European Commission or, if applicable, to other bodies of the European Union;

t) shall decide on assurance of handling nuclear items, ionizing radiation sources or radioactive wastes having been treated inconsistently with rules of law, or where the detrimental condition is not being removed;

u) shall be obliged to give out information according to special legal provisions and once a year to publish a report on its activities and submit it to the Government and to the public;

v) shall establish technical requirements to ensure technical safety of the specified equipment;

w) in agreement with the administrative authority, it shall supervise the activity of persons authorized by a special legal regulation;

x) shall give opinion on the area development and zoning and planning documentation in

y) view of safety and radiation protection for activities associated with the utilization of nuclear energy and radiation activities.

The SÚJB competence was further extended by Act No. 249/2000 Coll., on execution of state administration and inspection of chemical weapons ban, and by Act No. 281/2002 Coll., on some measures associated with the ban on bacteriological (biological) and toxin weapons, as amended by Act No. 186/2004 Coll.

5.2.2. Specification of Powers and Responsibilities of the Regulatory Body

Section 9 Paragraph 1 of the Atomic Act set forth the following conditions for utilization of nuclear energy and ionizing radiation:

"A license issued by the Office is required for:

a) siting of a nuclear installation or radioactive waste repository,

b) construction of a nuclear installation or category IV workplace,

c) particular stages, laid down in an implementing legal regulation, of nuclear installation commissioning,

d) operation of a nuclear installation or category III or IV workplace,

e) restart of a nuclear reactor to criticality following a fuel reload,

f) reconstruction or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness of a nuclear installation or category III or IV workplace,

g) particular stages of decommissioning of a nuclear installation or category III or IV workplace to the extent and in the manner established in an implementing legal regulation;

h) discharge of radionuclides into the environment to the extent and in the manner established in an implementing legal regulation;

i) ionizing radiation sources management to the extent and in the manner established in an implementing regulation;

j) radioactive waste management to the extent and in the manner established in an implementing legal regulation;

k) import or export of nuclear items or transit of nuclear materials and selected items;

l) nuclear materials management;

m) transport of nuclear materials and radioactive substances laid down in an implementing legal regulation; this license does not relate to the person performing the transport, or to the carrier, unless he is simultaneously the shipper, or consignor or consignee;

n) professional training of selected personnel (Section 18 Par. 5);

o) re-import of radioactive waste originated in the processing of materials exported from the Czech Republic;

p) international transport of radioactive wastes to the extent and in the manner established in an implementing regulation;

q) performance of personal dosimetry and other services significant from the viewpoint of radiation protection to the extent and in the manner established in an implementing regulation;

r) adding of radioactive substances into consumer products during their manufacturing or preparation or import or export of such products."

Other provisions of the Atomic Act define:

- conditions for a license issue (Section 10),
- probity and professional competence of the applicant for a license (Sections 11 and 12),
- content and particulars of a license application (Section 13),
- SÚJB conduct in the administrative proceedings (Section 14),
- license requisites (Section 15),
- alteration, cancellation and cessation of a license (Section 16).

The execution of state supervision of peaceful utilization of nuclear energy and ionizing radiation, including sanctions, is regulated in the Atomic Act, Chapter VI, including:

- SÚJB supervising activities (Section 39),
- remedial measures (Section 40),
- penalties (Sections 41 and 42).

The Atomic Act, together with Act No. 552/1991 Coll., on state control, provides SÚJB with sufficient powers to execute the state supervision as well as coercion means to enforce the compliance with legal requirements for nuclear safety and radiation protection.

SÚJB performs supervision of compliance with the Atomic Act and other regulations issued based on the Act by the licensees under the quoted Section 9 Paragraph 1. SÚJB supervisory activities are detailed in Section 39 Paragraph 1 of the Atomic Act.

The SÚJB personnel performing the supervision are nuclear safety and radiation protection inspectors appointed by the SÚJB chairperson. They are seated at the SÚJB headquarters as well as at Dukovany and

Temelin power plants and in regional centres. In the scope of supervisory activities, the inspectors and SÚJB Chairperson are mainly authorized to:

- enter the supervised buildings, facilities, operations, land and other premises associated with the utilization of nuclear energy or radiation practices at any time,

- perform measurements and collect samples from the inspected persons as necessary for enforcement of the Act and other regulations based on the Act,

- verify professional competence and special professional competence under the said Act,

- participate in the investigation and remedies of events important to nuclear safety, radiation protection, physical protection and emergency preparedness, including unauthorized handling of nuclear items or ionizing radiation sources,

- enforce the requirements and conditions of nuclear safety, radiation protection, physical protection and emergency preparedness, and technical specifications and operating procedures, and inspect the nuclear installation condition, and

- require evidence for observance of all the obligations set forth in nuclear safety assurance, radiation protection, physical protection and emergency preparedness of the nuclear installation.

If any deficiencies are identified by the inspector with respect to activities performed by the inspected person, they shall be authorized, depending on the nature of the identified fault, to:

- require the inspected person to remedy the situation within the specified term,

- order the inspected person to perform technical inspections, overhauls or tests on the operational capability of the installation, or any of its parts, systems or its assemblies, if necessary to verify the nuclear safety,

- disqualify an employee of the inspected person from special professional competence in the case of serious violation of duties, or failure of professional, physical or mental competence,

If there is risk of delay or in case of undesirable occurrence important to nuclear safety, radiation protection, physical protection and emergency preparedness, SÚJB shall be authorized to issue a provisional order imposing on the inspected person to reduce the power output or suspend the operation of the nuclear installation, stop the assembly of components or systems of a nuclear installation, prohibit handling of nuclear items, ionizing radiation sources or RAW, or to impose on the inspected person the obligation to sustain that handling is performed by another person at the expense of the inspected person.

For violation of a legal obligation established in the Atomic Act, SÚJB may impose a penalty up to the amount specified in Section 41, and in compliance with the rules specified in Section 42.

The binding procedures for supervising activities are set forth in the SÚJB internal documents.

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

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.

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

The number of positions approved in the SÚJB budget for 2008 is 198 of which approximately 2/3 are held by nuclear safety and radiation protection inspectors. The SÚJB budget for 2008 is approximately 386 mil. CZK. In the current situation of the Czech Republic, the material and human resources are sufficient to provide the basic functions imposed by law.

The SÚJB organizational structure is shown in Fig. 5.2.

5.2.5. Regulatory Body within the Structure of Governmental Bodies

As shown from the above-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 emergency preparedness. At the same time, the SÚJB competence does not overlap or contradict any other state administration bodies.

5.2.6. 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 June 2001.

In view of the results presented by the experts in their final reports, they found both the legislative framework and the execution of state supervision of peaceful utilization of nuclear energy and ionizing radiation at a very good level corresponding to the world’s good practices. In respect to the position of the regulatory authority within the state administration structure, the experts underlined that SÚJB had not only reached “de iure“ but also “de facto” independence. The experts also formulated specific recommendations which if implemented might further improve the level of supervision in the Czech Republic. The recommendations focused e.g. on special fields of supervision such as emergency preparedness training or further development of probabilistic methods used in nuclear safety evaluation. However, they concluded that those recommendations mostly concerned long-term development of the organization. The final reports of both the IRRT missions are available on the SÚJB website.

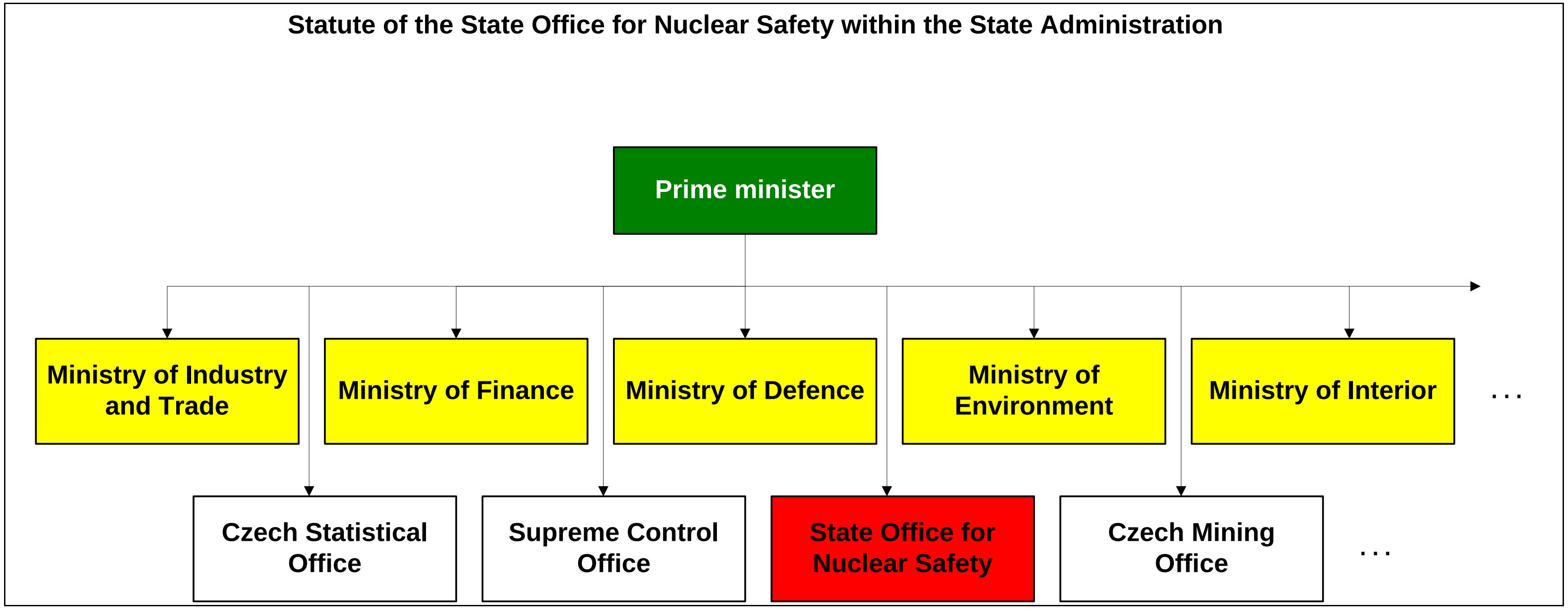


Fig. 5.1 Position of SÚJB within the structure of governmental bodies

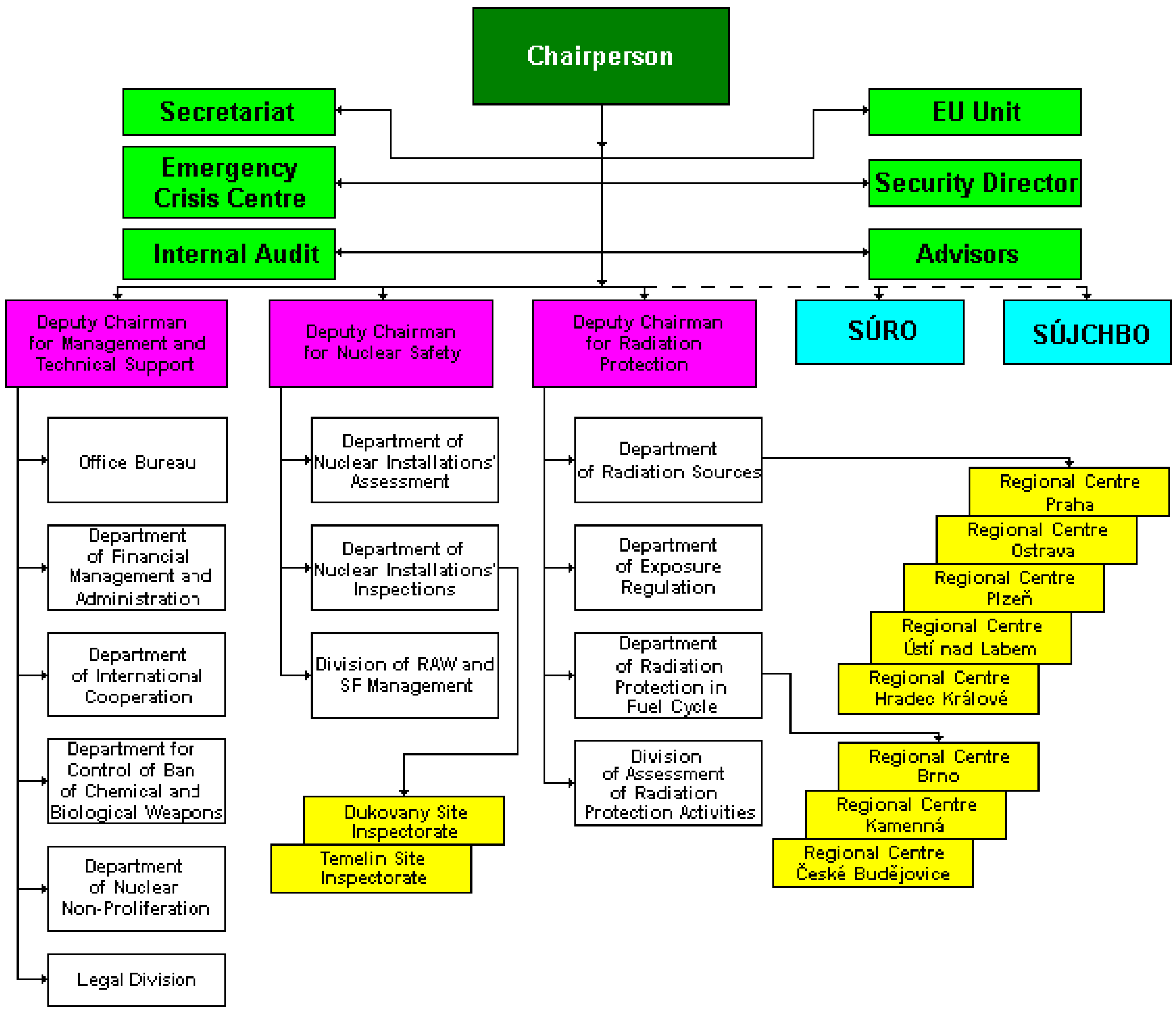


Fig. 5.2 SÚJB Structure

6. OTHER GENERIC SAFETY PROVISIONS

6.1. Responsibility of the Licensee

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 mainly discussed under Sections 17 and 18 of the Atomic Act where the licensee is required, amongst others, to ensure nuclear safety, radiation protection, physical protection and emergency preparedness of its respective nuclear installation followed by additional specific requirements for the nuclear safety system.

The regulator of nuclear safety is mainly responsible to supervise the performance and fulfillment of the above requirements. The rights of nuclear safety or radiation protection inspectors are specified under Section 39 Para 4, Points b), c) of the Atomic Act. In compliance with this law, the inspectors shall check for compliance with the terms and requirements for nuclear safety, radiation protection, physical protection, and emergency preparedness 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, the holder of the license to operate NPP Dukovany and NPP Temelin, SÚRAO and ÚJV Řež a. s. are charged with the primary responsibility for nuclear safety and radiation protection of their NIs and repositories. This responsibility is delegated to the respective managers at the executive level with the key role in terms of safety played by directors of those organizations. It shall be the highest priority of the Licensee to ensure nuclear safety, radiation protection and emergency preparedness. 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.

The licensee has implemented its own supervision system in order to follow 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, this event shall be recorded and examined, and followed by corrective actions provided to prevent recurrence of such event. This entire process shall be evaluated and monitored regularly and systematically by the state inspectors.

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

The Atomic Act, Section 18 stipulates the following personnel qualification requirements:

“Activities directly affecting nuclear safety may only be performed by natural persons who are physically and mentally competent, with professional competence and to whom the Office has granted an authorization for the activities in question, subject to an application by the licensee.

Only natural persons with knowledge of the principles and procedures of radiation protection, as verified by the Expert Examination Commission of the Office, and holding an authorization to perform the working activity in question granted by the Office may perform activities especially important from the radiation protection viewpoint specified by an implementing legal regulation."

Activities directly affecting nuclear safety and activities especially important for radiation protection and technical training and qualification requirements, including their testing and granting authorizations for persons authorized to perform the above activities, are set forth in the implementing regulation, Decree No. 146/1997 Coll. as amended by Decree No. 315/2002 Coll.

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 18, Paragraph 1, Point h) of the Atomic Act.

The financial means used for institutional control after closure of repositories where RAW generated during the decommissioning of nuclear installation or category III and IV workplace are disposed shall be deposited on a nuclear account funded by generators of RAW in the amount set forth in the Government Order No. 416/2002 Coll. as amended, which determines the amount and method of payment. The nuclear account is part of financial assets and liabilities administered by the Ministry of Finance and its purpose is mainly to ensure long-term accumulation of financial resources for the construction of repository for RAW and SF disposal.

6.2.1. ČEZ, a. s.

The responsibility for nuclear safety and radiation protection of NIs 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 Production Division who reports to Director General on the assurance of nuclear safety and radiation protection of the NIs within his/her responsibility.

By the law, the joint-stock company ČEZ is obligated to pay specific amounts on the nuclear account in order to make provision for decommissioning of nuclear installation. The payment on the nuclear account is set at CZK 50.00 per each MWh of electricity generated by nuclear plants under the Government Order No. 416/2002 Coll. The method used to make provision for decommissioning of nuclear installation is defined in Decree No. 360/2002 Coll., issued by the Ministry of the Industry and Trade, which determines how to make provision for decommissioning of nuclear installation or category III and IV workplace.

The statutory provision for decommissioning of NPP Dukovany made by ČEZ, a. s. amounts to 154.988 mil. CZK/year. The provision for decommissioning of NPP Temelin amounts to 152.864 mil. CZK/year. The annual provision for decommissioning of ISFSF Dukovany is 118 094 Kč. Since 2006, the provision of 184 328 CZK/year is made for decommissioning of SFSF Dukovany.

The creation of provision for decommissioning of nuclear installation is inspected and verified by the state organization of SÚRAO.

By internal decision of ČEZ, provision is also made for storage of SF. This provision is funded by the company profit and intended to cover the incurred ČEZ cost associated with the SF storage, and that also after decommissioning of nuclear units.

As of December 31, 2007, the power utility of ČEZ, a.s. provided the following financial resources:

- 1 308. 602 mil. CZK paid on the nuclear account for the fiscal period 2007;

- 5 607,661087 mil. CZK available as the provision for decommission of nuclear installation (of which CZK 4 349.940 mil. for NPP Dukovany, 1 256.290 149 mil. CZK for NPP Temelin, 1 062 282 CZK for ISFSF Dukovany and 368 656 CZK for SFSF Dukovany);

- 7 986.140907 mil. CZK available as the provision for storage of SF (of which 6 533.882 121 mil. CZK for NPP Dukovany, and 1 452.258 786 mil. CZK for NPP Temelin).

6.2.2. ÚJV Řež a. s.

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

It means that the HLW storage facility would be decommissioned in 2045 where its radioactive contents are to be removed to a repository whether – if permitted by the acceptance terms – the existing type or a planned DGR. If DGR is not available, the requirement for subsequent storage shall be addressed by construction of a new 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 December 31, 2007, ÚJV Řež a. s. made provision for decommissioning at CZK 86.3 mil., including HLW storage facility provision at 75 945 CZK/year and waste management facilities provision at 514 450 CZK/year.

The SF and RAW management are supported with a sufficient number of qualified personnel. The staff number is derived from analyses of licensed activities and supposed to meet the nuclear safety and radiation protection requirements during such activities.

6.2.3. SÚRAO

SÚRAO has proposals approved by SÚJB for closure of repositories, and it does not make provision for decommissioning being a state owned organizational unit by Section 18, Paragraph 1, Point h) of the Atomic Act. SÚRAO budget is agreed by the Czech Government. The activities associated with SÚRAO competencies are supported with a sufficient number of qualified personnel. The staff number is derived from analyses of licensed activities and supposed to meet the nuclear safety and radiation protection requirements in the course of such activities.

6.3. Quality Assurance

6.3.1. Present State

6.3.1.1. Legal Framework for Quality Assurance

Act No. 18/1997 Coll., on peaceful utilization of nuclear energy and ionizing radiation and on amendments and alterations to some acts, as amended (hereinafter the Atomic Act) defines the general conditions for execution of practices related to nuclear energy utilization, radiation practices, or exposure reduction interventions. The quoted Act, Section 4, Paragraph 8 reads:

"Any person performing or providing for practices related to nuclear energy utilization or radiation activities, with the exception to practices as in Section 2 a) items 5 and 6, must have implemented a quality assurance system to the extent and in the manner set out in an implementing regulation, aimed at achieving the required quality of a relevant item, including tangible or intangible products, processes or

organizational arrangements, with respect to the importance of this item from the aspect of nuclear safety and radiation protection. The implementing regulation shall establish the basic requirements for quality assurance of the classified equipment with respect to their safety classification."

In this case, SÚJB Decree No. 132/2008 Coll. is the implementing regulation laying down the basic requirements for the classified equipment quality assurance and their safety classification.

According to Section 13, Item 5 of the Atomic Act, a license granted by SÚJB for specific activities related to nuclear energy and ionizing radiation utilization is subject to approval of the quality assurance system for the licensed activity.

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

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

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

The joint-stock company ČEZ has implemented and documented a quality management system to support the processes and activities in the scope of the above nuclear activities in view of the obligations promulgated in the corporate Quality Policy. This quality management system is designed to support processes and practices in the area of SF and RAW management in a controlled and organized manner, and in full compliance with the Atomic Act and its implementing regulations, including SÚJB Decree No. 132/2008 Coll.

The quality management system implemented for nuclear activities also meets the requirements of the Czech standard ČSN ISO 14001 and follows to the greatest extent possible the IAEA recommendations in the Safety Standards. The requirements of the quality control system are applied using graded approach depending on the importance of each process or item to nuclear safety, radiation protection, emergency preparedness and physical protection.

On July 1, 2007, an organizational change was implemented in the company ČEZ, a. s. consisting in the establishment of Quality Management Section. The section reports to the Executive Manager in the organizational structure.

The mission of the newly established section is to:

- co-ordinate the improvement and development of quality management principles across ČEZ and reflect those principles in the ČEZ Group. Define controls and supervision to ensure that quality management principles are complied with and functional,

- complete the development and provide evaluation and continuous improvement of the ČEZ management system whose fundamental element is performance in full compliance with safety,

- set up quality management requirements and methodologies for activities of each process and implement an efficiency verification system, and

- ensure the application of NPP operational safety and stability support programs.

One of the upcoming goals of Quality Management Section is to implement the ČEZ integrated management system based on a process model with integrated safety, quality and environmental requirements (EN ISO 9001, 14001, 18001, IAEA Safety Standards requirements, The Management System for Facilities and Activities No. GS-R-3 and Application of the Management System for Facilities and Activities No. GS-G-3.1.). The management system providing guarantees of compliance with economic, safety and other requirements recommended by the International Atomic Energy Agency to nuclear utilities or entities operating nuclear plants.

6.3.1.3. Quality Assurance Strategy of SÚRAO

For the purpose of management of activities associated with RAW disposal, the Ministry of Industry and Trade set up the organization of SÚRAO whose responsibilities are detailed in Chapter 4 of the Atomic Act. SÚRAO has implemented and described a quality assurance system based on the Czech standard series of ČSN ISO 9001/2000, in compliance with the regulatory requirements and IAEA recommendations. The quality assurance system developed and used by SURAO allows meeting the regulatory requirements, in particular SÚJB Decree No. 132/2008 Coll., on quality assurance in activities associated with nuclear energy use and radiation practices and on establishing criteria for classification and categorization of classified equipment into safety classes.

6.3.1.4. Quality Assurance Strategy of ÚJV Řež a.s.

The quality management system implemented in ÚJV Řež is based on the application of EN ČSN ISO 9000 series of standards with the objective to assure product and service quality for clients while the regulatory standards applicable to the business are followed. The quality assurance procedures enforcing the nuclear safety and radiation protection requirements under Act No. 18/1997 Coll. as amended are based on the corporate Quality Policy approved by the general meeting. This Quality Policy is followed up with specific and measurable corporate Quality Goals mainly focused on technical and efficient management and improvement of processes.

6.3.1.5. Quality Assurance Programs for Each Stage of Lifetime of Nuclear Installation

6.3.1.5.1. Quality Assurance Programs of ČEZ, a.s.

The quality management system of ČEZ is described within a set of control documents. These control documents include:

- strategic documents (e.g. Quality Policy, Safety Policy, etc.) – Level I

- control documents (ČEZ rules, guidelines and procedures and Director General or Executive Director’s orders) – Level II

- working documents (e.g. methodologies, operating instructions, technological procedures) - Level III

The output from processes and activities (records) form a part of the ČEZ quality system documentation.

For the quality assurance of nuclear activities, ČEZ has implemented Quality Assurance Procedures, describing the licensee's quality management system and the affected processes and activities, including the definition of the licensee's and its contractors' responsibilities. In most cases, the above mentioned system of management documents is applied by PZJ to describe the quality system.

Quality Assurance Procedures are submitted by ČEZ to SÚJB for approval since their approval is required to issue a license for particular activities as stated in Section 13 Paragraph 5 of the Atomic Act. Also, reconstructions and other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness, or some major organizational changes in the joint-stock company ČEZ are approved through Quality Assurance Procedures for the respective licensed activities.

Quality Assurance Procedures for licensed activities are followed with the supplier's quality plans for components, systems, and services affecting nuclear safety or radiation protection of nuclear installations.

6.3.1.5.2. Quality Assurance Programs of SÚRAO

The quality management system of SÚRAO is described in a set of control documents, planning documents and partial Quality Assurance Procedures, or quality plans.

The law-making control documents are organized into 4 layers. The top layer comprises documents which set forth the quality policy and safety policy, environmental policy, and management system guide. Layer 2 includes rules and regulations that provide general requirements associated with each chapter of the Management System Guide. Layer 3 and 4 provide the control procedures for activities and specific operating procedures and guides.

Quality Assurance Procedures developed (and regularly updated) for each licensed radiation activity and operating permits for RAW repositories according to requirements of SÚJB No. 132/2008 Coll. describe the scope and method of application of the relevant parts of the quality management system to the stated items with the accent laid on specific obligations and responsibilities of the management and executive staff. In addition, so-called quality plans are provided (or, approved by SÚRAO) for especially extensive projects to provide the basis for control and supervision of the process and performance of qualitative indicators of such projects.

6.3.1.5.3. Quality Assurance Programs of ÚJV Řež a.s.

ÚJV Řež a. s. provides on-site storage for SF from research reactors and RAW generated from some other activities. RAW collection, transport, processing and storage are handled in a similar way. For quality assurance of the above activities, the company has implemented a quality management system described in the Quality Control Manual, the associated process manuals, and working instructions. The last layer of control documents also provides working and control procedures for each activity. The HLW storage facility is run by the Integrity and Technical Engineering Division. The quality assurance program for the operation of HLW storage facility, describing the comprehensive measures to ensure safe operation of the storage was developed in compliance with Decree No. 132/2008 Coll. A similar function is provided by the RAW management quality assurance program.

For each element of the quality assurance system to be fulfilled, both the documents underline the application of system-based measures to review, inspect, and improve the process efficiency.

6.3.1.6. Quality Assurance Program Efficiency Evaluation and Application Methods

6.3.1.6.1. Quality Assurance Program Efficiency Evaluation 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 equipment quality and process verification are described in the control documents as part of the documented quality control system. The responsibility for the quality system implementation rests with all company managers. Each employee is responsible for quality of his/her own work. The persons who perform inspections and surveillance are given the sufficient authority to identify discrepancies and if necessary, impose the appropriate corrective actions. The stipulated quality is verified by persons who do not perform inspections or surveillance. All company employees are entitled to initiate improvements or revisions of the quality control system.

For the quality control system maintenance and improvement, periodical training and education of ČEZ employees are perceived as investment in quality. ČEZ uses a consolidated training process for its employees in the quality assurance and improvement field at each level of management.

The efficiency of the quality control system is evaluated by ČEZ, a. s. and the system is updated on a yearly basis (at the end of each calendar year). Each level of the management will perform periodical assessment of all processes and procedures for their respective scope of responsibility, aimed to review their level and efficiency.

6.3.1.6.2. Quality Assurance Program Efficiency Evaluation in SÚRAO

The control system provides feedback at each level of management making it possible to demonstrate the compliance with the activity and process quality requirements. All managers will review the key processes and procedures in their scope of responsibility on a periodical basis.

SÚRAO has implemented a multi-level review process of jobs and internal rules. The quality manager will perform periodical assessment of the corporate quality system as a whole.

An internal rule “Quality System Audits” is available for partial internal and supplier quality audits (including RAW generators). These audits are performed in compliance with the annual schedule approved by the SÚRAO director. If needed, so-called external quality audit may be performed by an audit company with the appropriate certification. The above audits are used to identify the state of partial activities and processes and to verify the efficiency of the quality assurance system, both for SÚRAO and the suppliers of items important to nuclear safety and radiation protection.

6.3.1.6.3. Quality Assurance Program Efficiency Evaluation in ÚJV Řež a. s.

ÚJV Řež applies the controls, process efficiency assessment and feedback evaluation to determine the efficiency of quality assurance programs. For this purpose, the following is carried out:

- internal audits to verify the compliance of the implemented quality system with the current quality assurance programs,
- input documentation validation;
- regular vendor rating;
- control activities in the project design stage (operating activities);

- define contingencies and risks;
- propose control procedures and determine the process reference parameters;
- corrective actions and their verification;
- verify the efficiency of defined measures by the Division Supervisory Committee for Nuclear Safety and Radiation Protection;
- review of feedback application by the Nuclear Safety and Radiation Protection Supervisory Committee of ÚJV Řež, or discuss serious events by the company management.

In addition, the company management will review the implemented quality system as a whole twice a year.

6.3.1.7. Current Practices of State Supervision in Quality Assurance

According to Section 39 of the Atomic Act, SÚJB is responsible for supervision of the licensee with respect to compliance with provisions of this Act, including the above quality assurance requirements. If deemed necessary, SÚJB may extend this task to cover its contractors. The supervision is focused both on the system and quality assurance of the specific classified equipment. The SÚJB departments responsible for this activity primarily include the Nuclear Installation Evaluation Department, Radioactive Waste and Spent Fuel Management Division and Fuel Cycle Radiation Protection Department (see Fig. 5.2).

In compliance with the Atomic Act, SÚJB will approve the nuclear installation's quality assurance programs for SF and RAW disposal and storage that are essential to issue the below licenses as per Section 9, Paragraph 1 of the Atomic Act:

- NI / RAW repository siting,
- NI / RAW repository construction,
- NI commissioning stages,
- NI / RAW repository operation,
- reconstruction or other changes affecting nuclear safety, radiation protection, physical protection, or emergency preparedness of NI or RAW repository,
- NI / RAW repository decommissioning stages,
- management of ionizing radiation sources,
- RAW management,
- management of nuclear materials,
- technical training of selected staff,
- personal dosimetry and other services important to radiation protection.

In review of quality assurance programs, the compliance with the requirements set forth in SÚJB Decree No. 132/2008 Coll. is primarily verified.

SÚJB is also responsible to approve specific documents pertaining to quality assurance issues where the approval is required by the Atomic Act.

6.4. Operational Radiation Protection

6.4.1. Summary of National Legislation for Radiation Protection

The radiation protection for nuclear installations in the territory of the Czech Republic is regulated by the Atomic Act and its implementing regulation No. 307/2002 Coll., on radiation protection, as amended by Decree No. 499/2005 Coll.

The legislation in the field of radiation protection thoroughly complies with the internationally respected principles of radiation protection based on the recommendations from prestigious international non-governmental expert organizations (ICRP), in particular ICRP recommendation No. 60 issued in 1990, and the associated international fundamentals for radiation protection adopted by inter-governmental organizations, including IAEA. The above legal provisions were also initiated by the efforts to harmonize the radiation protection law of the Czech Republic with the relevant EU directives, in particular the European Commission Directive 96/29/Euratom of May 13, 1996. The radiation protection was fully harmonized with the EU law in 2002 by amendment to the Atomic Act and its implementing regulation – Decree No. 307/2002 Coll., on radiation protection, as amended by Decree No. 499/2005 Coll.

6.4.2. Implementation of Radiation Protection Requirements

6.4.2.1. Dose Constraints

The most common limits for whole body exposure are presented by the international recommended parameters describing the whole-body radiation effect (i.e. effective dose). They refer to the sum of external effective doses plus committed effective internal doses for a certain period of time. There are no limits specified for a period less than one calendar year, or more than five consecutive calendar years.

The limits are set lower for the public, that is individuals whose exposure is typically inadvertent and involuntary unlike those for the individuals who are aware of the risk taken, and their exposure is voluntary and deliberate whether part of their job, or part of their on-job training. The effective dose constraints for category A and B radiation workers, i.e. persons older 18 years, whose exposure to the ionizing radiation sources at work is deliberate and voluntary, following proven advice and information on the possible exposure level at work as well as on the associated risks, shall be 100 mSv within five consecutive calendar years while the value of 50 mSv shall not be exceeded per calendar year. For employees in category A, including amongst others all persons working in the radiation controlled areas of nuclear installations, routine and regular monitoring of personal exposure shall be introduced as well as keeping records of personal exposure for at least 50 years. For monitoring of category A and B personnel, Decree No. 307/2002 Coll., as amended by Decree No. 499/2005 Coll. specified easier to track and control, so-called derived limits, expressed in more directly measurable parameters.

The effective dose constraints for persons aged 16 to 18 (students and apprentices) who are exposed to ionizing radiation sources deliberately and voluntarily, following proven advice and information on the possible exposure level at work as well as on the associated risk during specialized occupational training for work with ionizing radiation sources, shall be 6 mSv per calendar year.

The general effective dose constraints, that are the limits applicable to any other public, shall be 1 mSv per calendar year, or as specified in the license to operate category III or IV workplaces, and emergency limit of 5 mSv for five consecutive calendar years.

6.4.2.2. Conditions for Discharge of Radioactive Material

Radioactive releases from NIs, both liquid and gaseous, are subject to license issued by SÚJB as per the provisions of the Atomic Act (Section 9, Paragraph 1, Point h), and details including criteria for issue of such a license, are given in Sections 56 and 57 of Decree No. 307/2002 Coll., as amended by Decree No. 499/2005 Coll. The controlled releases, containing radionuclides, into the atmosphere or waters may only be approved if such provisions are made that the effective doses received by the particular critical group of the population due to releases shall not exceed 250 µSv per year. In addition, the general limit of 1mSv for the annual effective dose from any sources also applies to radioactive releases from nuclear installations. The release shall be justified and optimized.

The authorized limits for releases from nuclear installations are not provided in any regulatory document. They are determined by SÚJB for each particular nuclear installation and set below 50 µSv/year for both the Czech NPPs. The actual values of radioactive releases are controlled and evaluated by the plant operators/utilities based on the monitoring program approved by SÚJB.

An extensive monitoring system was implemented for actual release tracking supported by the operators of nuclear installations and independent measurements directly performed by SÚJB or through SÚRO. The measurement results are reliable enough to document that the authorized limits are not 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 17 of Decree No. 307/2002 Coll., as amended by Decree No. 499/2005 Coll. They are reviewed in the licensing process and periodical inspections. For a nuclear installation, it means that:

- prior to start of operation, alternative solutions must be considered for radiation protection and the cost of associated protection measures, collective doses and doses of the relevant critical group of the population must be reviewed and compared,

- in the course of operation, received doses are analyzed on a periodical (yearly) basis depending on the task performed while additional possible actions to ensure radiation protection are considered and compared to similar operations.

6.4.2.4. Radiation Monitoring in the Vicinity of Nuclear Installations

The nuclear operator (licensee) shall be responsible for radiological environmental monitoring. A monitoring program authorized by SÚJB shall be followed. This monitoring program shall define the scope, frequency, and methods of measurement and evaluation of results as well as the associated reference levels. At present, the radiological environmental monitoring is performed by the nuclear operator through its environmental radiation monitoring labs. SÚJB is responsible for supervision of the compliance with the monitoring program and for its own independent measurements.

The off-site dose rates are continuously monitored at NPP Dukovany and NPP Temelin using a teledosimetric system operated by NPP. In addition, there is at least one off-site monitoring point of the national independent early detection network (see Chapter 6.5). The off-site dose equivalent from external radiation is monitored using local networks of thermoluminiscent detectors controlled by the radiation monitoring laboratory of the particular NPP. Independent of those networks, the relevant regional centres of SÚJB performs measurements using thermoluminiscent detectors. In the present operation, none of the authorized limits have been exceeded in any of the above mentioned networks due to NPP operation.

Periodical radiological environmental sampling and measurements of NPP Dukovany are provided by the Radiation Monitoring Lab and the independent SÚJB Regional Center in Brno. The radiological environmental monitoring of NPP Temelin is provided by the Environmental Radiation Monitoring Lab and the SÚJB Regional Center in České Budějovice.

Since nuclear installations are included in the National Radiation Monitoring Network, measurement overviews are periodically submitted to the supervisory bodies. In addition, the utility takes its own initiative to issue various reference materials for the public. This area is regulated by the Government Order No. 11/1999 Coll., on the emergency planning zone (see Chapter 5.2).

There are additional off-site measurements performed, in particular aimed to detect and assess any possible radioactive leaks, and to provide reliable basis for decision-making about public protection measures. These measurements are performed within the National Radiation Monitoring Network whose function and structure are stipulated in Decree No. 319/2002 Coll., as amended by Decree No. 27/2006 Coll. SÚJB is responsible to control the activities of the National Radiation Monitoring Network, both its permanent and emergency services. The permanent service is used for monitoring of normal operating conditions while the emergency services are mobilized in case of emergency. The normal mode is primarily used for the actual radiation situation monitoring and early incident detection while the emergency mode is used to evaluate the consequences of an incident. Monitoring results submitted as part of annual reports on the radiation situation in the Czech territory to the Civil and Emergency Planning Committee and to the public through regional authorities, hygienic stations, or libraries.

The permanent service of the Radiation Monitoring Network includes the following:

- Early detection network comprising of 54 continuously operated measurement points with automatic measurement transmission to the central database,

- Territorial TLD network of 184 measurement points equipped with thermoluminiscent dosimeters. This network is operated by SÚJB regional centers with the assistance of SÚRO,

- Local TLD networks of 21 off-site measurement points equipped with thermoluminiscent dosimeters for NPP Dukovany and NPP Temelin, serviced by NPPs and SÚJB Regional Centres in Brno and České Budějovice,

- Territorial air contamination measurement network comprising of 13 measurement points equipped with high-capacity aerosol and pollutant sampling equipment operated by SÚRO, and SÚJB regional centres, and NPP environmental radiological monitoring labs.

- Lab network consisting of the SÚJB regional centre laboratory in České Budějovice, 3 SÚRO laboratories, and 2 NPP environmental radiological monitoring labs equipped for gamma spectrometry, or possibly radiochemical analysis of radionuclide contents in environmental samples (such as aerosols, pollutants, food, drinking water, or feed, etc.)

- Mobile service (aircraft or cars) operated by SÚJB or its regional centres, and SÚRO, the Ministry of Defence, Ministry of Interior, and NPP Dukovany and Temelin provided with air (volume activity) and ground (radionuclide deposition) dose rate measurement devices,

- Czech military network consisting of 15 fixed measurement points of which 2 in automated trial operation.

The purpose of the measurement monitoring program within the Radiation Monitoring Network is to track space and time distribution of radionuclides activity and ionizing radiation doses in the Czech territory, and in particular to provide long-term trends and ensure early detection of any deviations. The attention is given to artificial radionuclides of which those measurable and traceable are listed below:

- ^{137}Cs, 90Sr, $^{239+240}$Pu and ^{85}Kr in the atmosphere,

- ^{137}Cs, ^{90}Sr and ^{3}H in foodstuffs,

- ^{137}Cs in human body.

It was proven by participation in international exercises that the Czech Radiation Monitoring Network as a whole is comparable with the European standard in terms of its equipment as well as the density of measurement points.

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 set forth in the above Act – see Chapter 5.2.2.

The radiation protection is supervised by SÚJB radiation protection inspectors. There are currently 55 inspectors in total, both at the headquarters in Prague and at seven detached workplaces all across the country referred to as regional centres. The inspector shall prove the necessary expertise and qualifications in the supervised area and 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:

- standard (routine) inspections performed by the regional centres,

- specialized inspections performed by a team of experienced inspectors for nuclear energy, mining and processing of uranium, RAW, nuclear medicine, radiotherapeutic sources, radiodiagnostic sources, or main industrial and natural sources, and

- specific ad-hoc inspections by teams consisting of the most experienced inspectors.

A large number of internal guides have recently been prepared for supervision as well as control documents for evaluation of different types of inspections that are used for all types of supervision.

6.5. Emergency Preparedness

6.5.1. Applicable Law

The obligations of licensees, that is operators of nuclear installations or workplaces where radiation practices are performed, including the SF and RAW management, in the area of emergency preparedness are primarily established in the Atomic Act, and its implementing regulations, or the associated government orders. The additional obligations are set forth in other regulatory guides such as Act No. 239/2000 Coll., Act No. 240/2000 Coll., Government Order No. 462/2000 Coll., or the Ministry of the Interior's Decree No. 328/2001 Coll., all as amended later.

6.5.2. Implementation of Emergency Preparedness Measures, including the Role of State Supervision and Other Bodies

6.5.2.1. Clasification of Extraordinary Events

For the purpose of severity assessment of extraordinary events that might occur during operation of a nuclear installation, or a workplace where radiation activities are performed, three basic levels of events are classified (Section 5 of SÚJB Decree No. 318/2002 Coll.).

6.5.2.2. National Emergency Preparedness and Response Systems

In compliance with the legislation mainly in the area of crisis management, the emergency preparedness system structure was implemented in the Czech Republic to address various emergency conditions. Figure 6.1 provides the basic structure of the crisis (emergency) preparedness system.

An extraordinary event - an accident in the Czech Republic or abroad, with a potential impact on the territory of the Czech Republic, shall be addressed using the crisis (emergency) response system of the basic structure as shown in Fig. 6.2.

The Czech Government is the superior body responsible for preparedness for crisis situations and, if such situations arise, for their management on the country's territory. The Constitutional Act No. 110/1998 Coll., on safety of the Czech Republic, established the National Safety Board.

Further to the act, the government in its resolution No. 391 of 1998, as amended later, established membership on the National Safety Board and approved its main tasks in preparedness for crisis and management of crisis situations.

In parallel, the Committee for Civil and Emergency Planning was established as a standing working body of the National Safety Board responsible for co-ordination and planning of internal national security provisions, public and economic protection, and for co-ordination of requirements for civil resources necessary for safety assurance of the Czech Republic. 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.

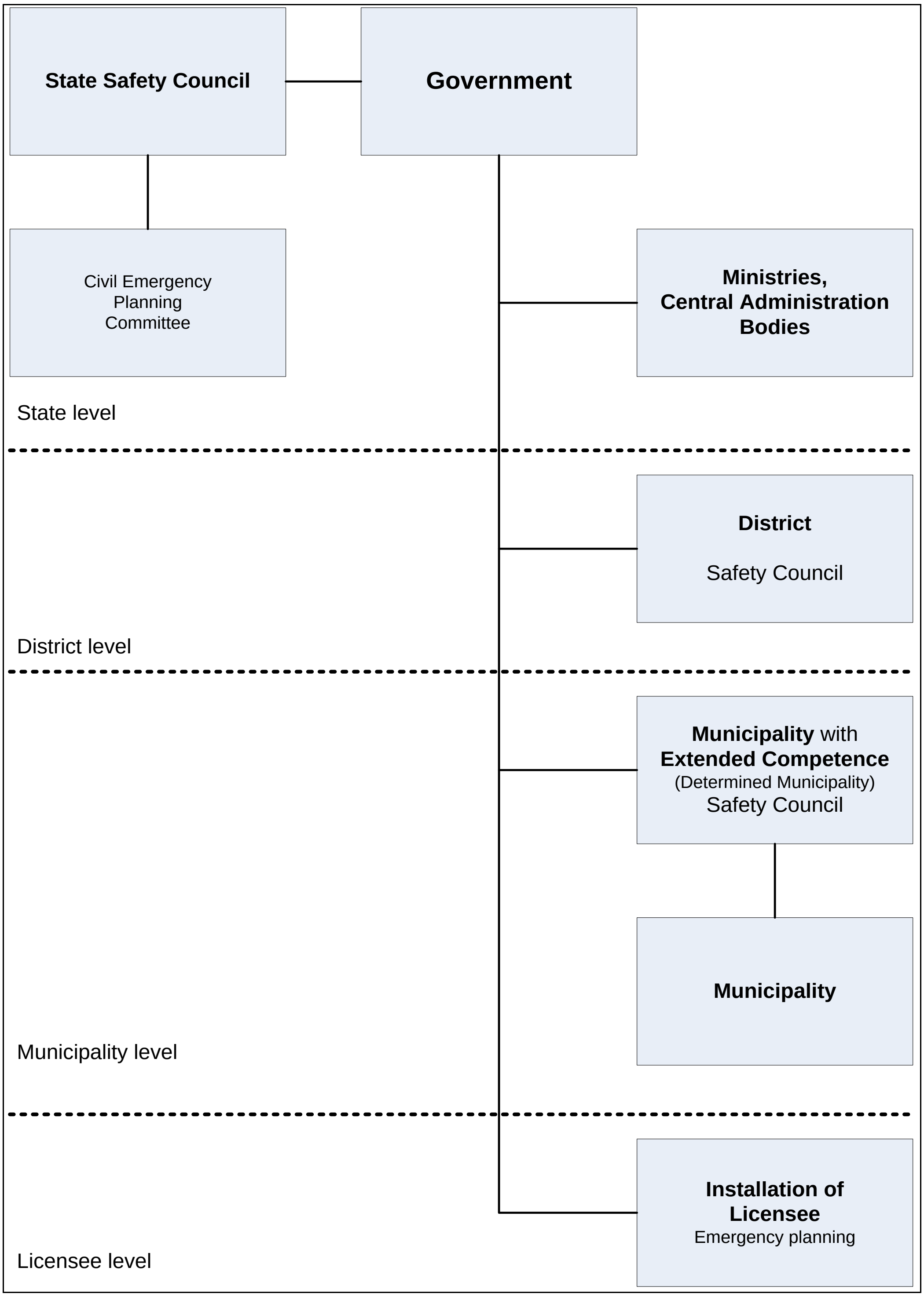


Fig. 6.1 Basic structure of emergency preparedness in the Czech Republic in case of an extraordinary event

The main tasks in emergency planning and preparedness, including radiation accidents, are specified in the rules of procedure of the Committee for Civil and Emergency Planning.

The Committee for Civil and Emergency Planning is presided by the Minister of the Interior and its members are deputy ministers and SÚJB chairperson. The Committee may establish ad hoc expert working groups.

These working groups consist of experts (specialists) in the respective fields of public and environmental protection in case of emergency occurrence (industrial accidents, or natural disasters etc.).

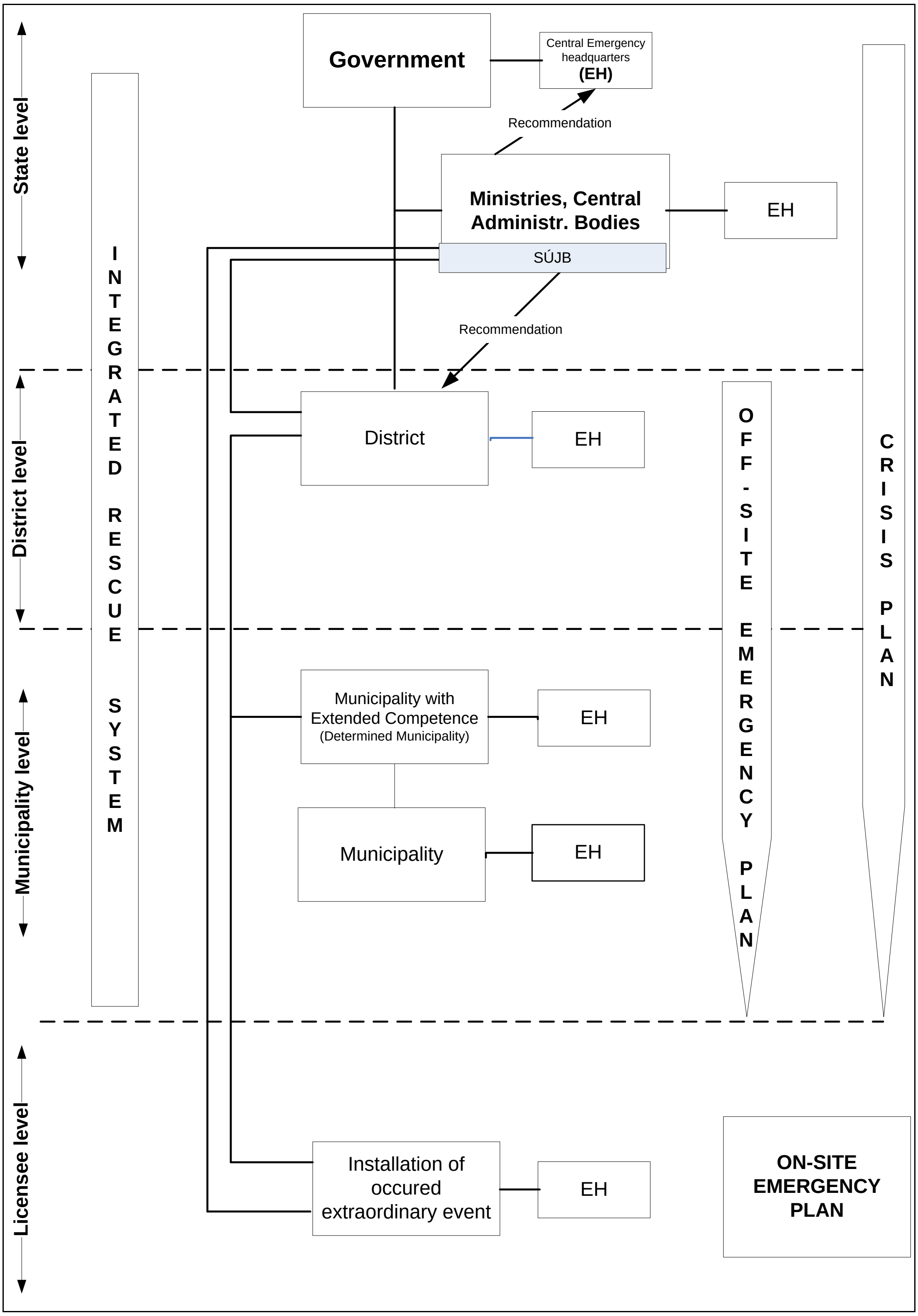


Fig. 6.2 Basic Structure of Emergency Response to Radiation Accident in the Czech Republic

The Central Crisis Staff was formed as a working body of the National Safety Board to deal with emergencies, including radiation accidents, at the national level. The Central Crisis Staff are presided by the Minister of the Interior and consist of deputy ministers and senior executives of other central state administration bodies, including SÚJB chairperson.

The Central Crisis Staff are also mobilized in case of radiation accidents outside the Czech Republic with potential impact on the Czech territory, or in case of radiation accidents during transportation of nuclear and radioactive materials.

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

NIs or workplaces where radiation practices are performed, that are amongst others SF or RAW management activities, shall prepare on-site emergency plans as well as intervention instructions in compliance with SÚJB Decree No. 318/2002 Coll. as amended by Decree No. 2/2004 Coll. This obligation applies to:

- RAW repository and RAW storage facilities classified in SÚJB Decree No. 307/2002 Coll.. as amended by Decree No. 499/2005 Coll. as Category IV workplaces, and

- Workplaces where radiation practices are performed, including RAW and SF management, classified according to SÚJB Decree No. 307/2002 Coll.. as amended by Decree No. 499/2005 Coll. as Category IV and III workplaces

Emergency preparedness documents as specified above must be prepared by each of the following licensees:

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

- ALLDECO CZ, a. s.

The mandatory contents of on-site emergency plan are specified in SÚJB Decree No. 318/2002 Coll. as amended by Decree No. 2/2004 Coll.

Therefore, each holder of the license to operate a nuclear facility has prepared its on-site emergency plan to include extraordinary events in RAW management. For NPP Dukovany, SF management in ISFSF and SFSF Dukovany are included in the on-site emergency plan. The on-site emergency plan of ÚJV Řež a. s. covers the entire site while specific emergency plans are set out for each building where radiation practices are performed. The provisions of emergency preparedness, including the SF management, are required for the LVR–15 research reactor buildings of HLW storage facility.

The on-site emergency plan documentation or any amendment thereof, is subject to SÚJB approval. SÚJB controls the emergency preparedness provisions of each licensee, in particular their compliance with approved on-site emergency plans.

6.5.2.4. Off-site Emergency Plans

In compliance with Act No. 18/1997 Coll. and Government Order No. 11/1999 Coll., the above mentioned NIs were analyzed to determine their potential for occurrence of radiation events and their public and environmental consequences. Those analyses were submitted for SÚJB review.

For NPP Dukovany and NPP Temelin, SÚJB decided to set up emergency planning zones based on the assessment of stipulated extraordinary events and their consequences from nuclear installation technologies intended for electric power generation.

No additional emergency planning zones were defined by SÚJB 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 where in case of RAW repository Dukovany also considering the existing emergency planning zone.

For NPP Dukovany and NPP Temelin emergency planning zones, the off-site emergency plans were (in compliance with Act No. 18/1997 Coll., and Act No. 239/2000 Coll., and Act No. 240/2000 Coll., and the Ministry of the Interior's Decree No. 328/2001 Coll.) prepared by the relevant regional offices with the assistance of municipal offices with extended powers whose territories are included in emergency planning zones.

Off-site emergency plan details as specified in the Ministry of the Interior's Decree No. 328/2001 Coll.

6.5.2.5. SÚJB Response to Extraordinary Event

In compliance with the provisions of the Atomic Act dealing with the occurrence of radiation incident or accident, SÚJB shall be responsible to support Emergency Response Centre and manage the actions of the National Radiation Monitoring Network and function as its headquarters. In compliance with the provisions of the Crisis Act, Emergency Response Centre shall represent the crisis management center, i.e. also support the activity of the Crisis Staff, including the contact point service intended to continuously receive and deliver information on the occurrence of radiation incident or accident.

For any extraordinary occurrence, the Crisis Staff at Emergency Response Centre workplace shall be focused to:

- evaluate and forecast the development of technology conditions in conjunction with the measures being implemented by operators of the nuclear installation, including detection of the source term for radioactive leaks into the environment, based on the data and information provided from the nuclear installation and using the technical equipment and methodology or program tools,

- evaluate the performance of on-site emergency plans,

- evaluate the radiation situation of the nuclear installation based on the data and information provided and using the technical equipment and methodology or program tools,

- co-operation with Czech Hydrometeorological Institute to forecast spreading of radioactive materials from the source of radiation accident, and provide information on the potential exposure in the vicinity of the nuclear installation based on the weather situation and its predicted progress, including specification and clarification of possible levels of the radiation situation based on the information on radioactive leaks from the nuclear installation,

- specify the source term of radioactive leaks and the range of affected area based on the data and information achieved by monitoring of the radiation situation using the teledosimetric systems of the nuclear installation, mobile groups in the vicinity of the nuclear installation aircraft groups, or any other activated components of the Radiation Monitoring Network while using the technical equipment, and methodology or program tools,

- provide the basis for determination of protective measures for the population and environment in the emergency planning zone of the nuclear installation, and provide the information and messages on the occurrence and development of the radiation accident, including any information on the radiation situation, and the measures being implemented to protect the population and environment, or revocation of those measures for the relevant crisis staff, safety board, and if applicable, the Government, or other state administration bodies, and the public,

- report to the IAEA as stated under the Convention on early notification of a nuclear accidents and Convention on assistance in the case of a nuclear accident or radiological emergency, and the contact points of other countries based on the international bilateral agreements in force.

6.5.2.6. Training and Drills

Each NI or workplace with radiation practices shall develop its theory and practical training plans for its personnel and other individuals or components to handle each level of extraordinary events.

Emergency exercises are performed according to the emergency exercise plan setting the exercise focus, scope and dates, or their frequency, if applicable. The emergency exercise plan is prepared for each calendar year and submitted to SÚJB by the end of the prior calendar year.

The emergency exercise plan used to verify activities of the emergency plan and intervention instructions is based on the following practices:

- intervention procedures or intervention instructions for extraordinary event level one or two performed once a year,

- intervention procedures and the related intervention instructions for extraordinary event level three performed at least once in two years.

Emergency exercises consist of the preparatory, implementation and evaluation stages.

Emergency preparedness in the emergency planning zone is verified by exercises under the off-site emergency plan for extraordinary event level three – radiation accident. The exercise is prepared by the regional authority with the assistance of the licensee. The parties involved in the exercise are the licensee, regional authority, the Integrated Rescue System components (fire brigade, police, health service), or other bodies and organizations covered by the off-site emergency plan and SÚJB.

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

6.5.2.7. Supervision by SÚJB

SÚJB is responsible for supervision of the licensees to determine the state of emergency preparedness in compliance with Act No. 18/1997 Coll. as amended, and Act No. 552/1991 Coll. as amended. The supervision of this area is focused on:

- up-to-date on-site emergency plans approved by SÚJB,
- intervention instructions in place, their mutual link and relationship to the intervention procedures stipulated in the on-site emergency plans,
- theoretical and practical training level of the personnel and other individuals to handle extraordinary events,
- theoretical and practical training level of the individuals determined in the on-site emergency plans to manage and perform interventions to handle extraordinary events,
- observance of the emergency training plans,
- performance and documentation of the functionality testing on the technical equipment, systems and devices necessary to control and perform interventions at a nuclear installation or a workplace where radiation activities are performed,
- contracting of other individuals required to perform the intervention or activity to handle an extraordinary event as listed in the on-site emergency plan.

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

6.6. Decommissioning

6.6.1. Summary of National Law for Decommission

Decommissioning of NIs in the Czech Republic is regulated by the Atomic Act and its implementing regulation issued by SÚJB under No. 185/2003 Coll., on the decommissioning of nuclear installations or workplaces in category III or IV, and SÚJB Decree No. 307/2002 Coll., as amended by Decree No. 499/2005 Coll. on radiation protection.

With reference to the Atomic Act, decommissioning of a NIis one of the activities associated with utilization of nuclear power while decommissioning is defined as the activities aimed to remove NIs or workplaces where radiation practices were performed for other purposes.

The Atomic Act, Chapter Three, set forth the prerequisites for utilization of nuclear power and ionizing radiation with respect to the activities associated with utilization of nuclear power. In Section 9, this prerequisite means a license issued to an applicant by SÚJB within its competency defined under Section 3 thereof. As stated in Section 3, SÚJB shall approve the documentation required under this Act for the given license applications. The license shall be issued for each decommissioning stage 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 (SÚJB Decree No. 185/2003 Coll.)

The preparation for decommissioning shall be included in each lifecycle stage of a NI. 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 NIshall include a concept for safe decommissioning of the installation or workplace licensed, including RAW disposal. The licensing documentation for each commissioning stage of a NIfor initial fuel load shall also include the proposed method of decommissioning approved by the Office as well as the shall include a proposed decommissioning procedure approved by SÚJB and the estimated cost of decommissioning verified by SÚRAO. The realized scope and method of decommissioning as approved by SÚJB are specified in the SÚJB Decree No. 185/2003 Coll.

The environmental impact assessment of decommissioning shall be required to issue the decommissioning license if stipulated by a special regulation (Act No. 100/2001 Coll., on assessment of environmental impacts and changes in some related acts). The applicant is obligated to submit the required documentation as part of the decommissioning license application. The binding contents of the license documentation for each decommissioning stage of a nuclear installation are set out in Annex to this Act.

For decommissioning, the holder of the license to operate a nuclear facility is obligated under the provisions of Section 18 of the Atomic Act and based on the estimated total cost of decommissioning as verified by SÚRAO to make steady provision for the monetary funds deposited on a blocked account to be available for the preparation and process of decommissioning at the required time and cost in compliance with the decommissioning proposal approved by SÚJB.

6.6.2. Supervision

The license for each commissioning stage of a NI and 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 proposal for a nuclear installation, the supervision shall be related to approval process for each commissioning stage as per Section 9, paragraph 1, letter c) and the operation as per Section 9, paragraph 1, letter d) of the Atomic Act.

The decommissioning of NIs is supervised by SÚJB inspectors. There are 2 inspectors appointed for this task at the headquarters in Prague. More radiation protection or nuclear safety inspectors of the SÚJB headquarters and inspectors of the SÚJB regional centres may be involved as needed for supervision and the

7. SAFE MANAGEMENT OF SF

7.1. General Safety Requirements

The general safety requirements are incorporated in the supreme law that is the Atomic Act of the Czech Republic. Chapter two of this Act regulates the general conditions for the execution of activities associated with utilization of nuclear power. The Atomic Act, Section 4, Paragraph 3 clearly stipulates that:

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

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, 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.

The safety requirements essential for commissioning and operation of any nuclear installation are stipulated in Decree No. 106/1998 Coll., on nuclear safety and radiation protection assurance during commissioning and operation of nuclear facilities.

The regulatory requirements for subcriticality and heat sink in SF management are detailed in Section 47 of Decree No. 195/1999 Coll., on the requirements for nuclear installations relating to nuclear safety, radiation protection and emergency preparedness.

RAW generated from SF management shall be minimized by the actual storage technology. At NPP Dukovany, the residual contamination from cask surface decontamination prior to transportation from HVB to ISFSF Dukovany and SFSF Dukovany is the only potential source of liquid and solid RAW. Residual contamination may only be released from cask surface during periodical cask treatment in ISFSF Dukovany where radionuclides may be carried over to cleaning solutions, detergents, or the personnel safety devices.

In 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 (presently, Act No. 44/1988 Coll. and Act No. 61/1988 Coll., as amended).

The relationship between different 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, or 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, or activities associated with the preparation, construction, commissioning, operation and decommissioning of storage systems.

In the Czech Republic, the public and environmental protection against radiological hazard due to SF management is mainly embodied in the Atomic Act and Decree No. 307/2002 Coll. as amemnded by Decree No. 466/2005 Coll., on the radiation protection. In compliance with the international recommendations and according to the European Community law, this Decree stipulates the exposure limits (general limits, radiation personnel limits and limits for apprentices and students), derived and authorized limits of exposure.

Any potential environmental impact, that is even biological or chemical hazard, possibly related to SF management, shall also be reviewed and evaluated as stipulated by the Act No. 100/2001 Coll., on the review of environmental effects. Annex 1 to this Act No. 100/2001 Coll. classifies *„The facilities intended for processing of spent or irradiated nuclear fuel or highly active radioactive wastes“*in 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. While some activities shall continue even in far future such as development, construction and operation of DGR, the prerequisites are set for such activities to be successfully continued. That is primarily the financial and institutional provision for such activities regulated under the Czech law.

7.2. Existing Facilities

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

At the NPP Dukovany site, SF is generated from four VVER 440/213 reactor units. These light-water reactors are operated in refueling cycles. Once a year, each reactor unit is shut down for planned refueling and equipment review. During a refueling, some of VVER 440 spent FAs having worked the required number of cycles are 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 reactor unit is approximately 10 t. SF will reside in SF pools at least for five years and currently 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 of 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 of special material ATABOR (stainless steel containing boron). The lower part of each tube is welded onto the 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:

- provide storage of 60 pcs of CASTOR-440/84 casks containing SF,
- remove casks using a crane,

- reduce to minimum the radiation exposure outside of the building well below the permitted values,
- provide cooling of the stored casks and decay heat sink to the environment using natural aeration,
- create working conditions for the personnel of ISFSF Dukovany,
- possibility to perform inspections and minor repairs of casks,
- protection against weather effects,
- in conjunction with the physical protection system it prevents unauthorized access, and
- provide shielding from solar radiation.

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

The design of CASTOR-440/84 cask provides for the following functions:

- reduces the gamma dose rate from SF on the packaging surface,
- reduces the dose rate equivalent from neutrons on the packaging surface,
- prevents radioactive leak from the inside space of the packaging,
- maintains fuel subcriticality,
- provides for fuel decay heat sink.

7.2.1.3. SFST Dukovany

SFST Dukovany was put into trial operation in December 2006 and its functions are identical to conceptual similar ISFS Dukovany connected with a passage corridor.

SFSF Dukovany identification:

Cask supplier for the initial operation	GNS mbH Essen
Building contractor	HOCHTIEF VSB, a. s.
Designer	ÚJV Řež a. s., Energoprojekt Prague Division
Construction start date	12/2002
Completion date	03/2006
Start of trial operation	12/2006
Facility length	107.9 m
Facility width	34.6 m

Facility height app. 20 m

Facility capacity 1340 t of heavy metal.

The safety assurance of SF storage in SFSF Dukovany is based on the properties of dual-purpose cask whose design meets all the safety criteria similar to CASTOR-440/84 cask used in ISFSF Dukovany. SFSF Dukovany will only hold cask types B(U) and S approved in compliance with the Atomic Act and the related SÚJB Decree 317/2002 Coll. CASTOR-440/84M casks supplied by the company GNS mbH Essen are used for the initial period of operation at SFSF Dukovany.

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

Design of CASTOR-440/84M cask primarily consists of a thick-walled cylindrical body of část iron with spheroidal graphite, provided with two-lid closing system and basket. The primary and secondary lids of the cask closing system are forged stainless steel fitted on the cask body using round screws. A protective plate is mounted on the two-lid closing system to protect against mechanical and weather effects. For neutron shielding, two overlapping rows of annular polyethylene rods are placed in the wall of the cylindrical cask body. For the same purpose, polyethylene plates are placed under the secondary lid and in the cask bottom. For cask handling, a pair of trunnions is bolted on the lid side and bottom side of the cask body. The basket consists of 84 hexagonal aluminum sections to seat fuel assemblies, separated with boron steel plates (Atabor), and stable aluminum panels in the edge area.

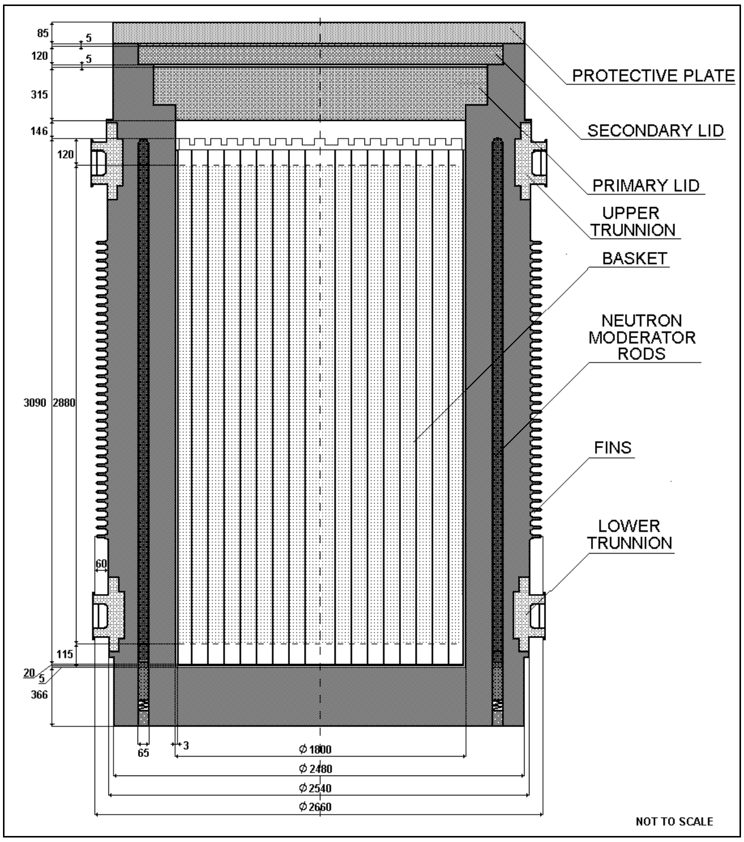


Fig. 7.2 CASTOR-440/84M cask (storage configuration)

The basic parameters of CASTOR-440/84M cask:

Diameter	2660 mm
Height	4170 mm
Wall thickness	410 mm
Material	cast iron with spheroidal graphite
Loaded cask weight	
− excluding shock absorbers	116 110 kg
− including shock absorbers (transport configuration)	138 160 kg
− including protective plate (storage configuration)	117 080 kg
− including repair lid and VR protective plate	
(VR storage configuration)	119 310 kg
Maximum FA heat output	24.66 kW
Maximum total permitted activity	$2.6.10^{17}$ Bq
Maximum dose rate on cask surface	
(the most exposed area)	< 2 mSv/h
Maximum dose rate at distance of 2 m	< 0.1 mSv/h

Number of fuel assemblies	84 pcs
Maximum heat output per fuel assembly	340 W

7.2.2. Nuclear Power Plant Temelín

At the NPP Temelín site, the SF is generated from operation of two VVER 1000/320 reactors. Similar to NPP Dukovany, the reactors are operated in refueling cycles whereas the fuel resides in the reactor for the duration of 4 years.

The core contains 163 FAs and 61 control elements arranged into a hexagonal array. The total weight of a fuel charge is 92 t.

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. Borid acid is solved in water with the minimum concentration of 11.44 g/l. The water charge is cooled using three identical interconnected cooling circuits with each circuit rated to cover by itself with a great margin the normal operating heat load of the entire pool (i.e. less emergency unloaded core) up to 2.83 MW_t.

If cladding leak was identified on FAs, or fuel rods, during testing, the damaged elements are 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 nests, is always reserved for single and full core unload.

7.2.3. ÚJV Řež a. s.

7.2.3.1. Bldg. 211/7 - SF Storage Facility

The SF storage facility is used for temporary storage of activated probes, loops, or any other active experimental materials (Pool B) and for temporary storage of SF from LVR-15 reactor (Pool A). The storage area is composed of two stainless steel plate pools with demineralized water. These pools are provided with a process water purification system and water extraction pump with the capacity of 60 l/min. In addition to pools, there are also six dry stainless storage channels anchored in the floor. A water layer provides shielding of active equipment in the pools and steel plugs are used in dry channels. The activated equipment is removed from the reactor hall using a special self-powered truck loaded with equipment in containers. The area is equipped with a bridge crab crane.

No SF, or old experimental equipment was placed in Pool A and Pool B as of December 31, 2007.

7.2.3.2. Bldg. 211/8 - HLW Storage Facility

Bldg. 211/8 – HLW storage facility is used for storage of SF from nuclear reactors and the following RAW categories:

- HLW,

- surveillance and assessment program RAW,

- solid non-standard waste.

Higher-activity RAW is kept fixed in concrete barrels of 200 liters using storage boxes (II, IV). The waste from surveillance program is stored using metal containers in Box I. The non-standard solid RAW is stored in Box III. During the reconstruction of the high-level waste storage facility, EK-10 fuel type handling technologies are installed in Boxes VI – VIII.

Box I.	–	Waste from the surveillance program
Box II.	–	Barrels with solidified RAW
Box III.	–	Non-standard waste
Box IV.	–	Barrels with solidified RAW
Box V.	–	Special storage units used for FAs EK–10 (now empty)
Box VI.	–	Storage equipment (storage safe)
Box VII.	–	Hot cell
Box VIII.	–	Hot cell control room

7.3. Siting of Proposed Installations

In late 2007, activities were carried out in the Czech territory associated with the siting of a new SF storage facility, SFSF Temelin with the capacity of 1370 t of heavy metal. Considering the capacity of SF pools at NPP Temelin, it is necessary to put the SFSF Temelin in trial operation no later than 2010.

Since September 2005, the following was carried out:

- MŽP ČR issued a concurring opinion (November 23, 2005),

- European Commission issued a concurring opinion related to the plan of RAW disposal inconnection with local adjustments at NPP Temelin in the Czech Republic in compliance with the EURATOM Agreement, Article 37 (November 24, 2005),

- SÚJB issued an authorisation for the company ČEZ to site a SFSF on the proposed land (December 29, 2005),

- Regional authority of South Bohemia issued a zoning and planning decision to place the construction “Spent fuel storage facility on the NPP Temelin site” (October 25, 2006),

- cask supplier competition started for the initial period of operation of SFSF Temelin and the company GNS mbH was selected (December 2006).

In early 2008, the application for construction authorization of SFSF Temelin was submitted to SÚJB and in August 2008 this authorization was issued.

7.4. Installation Design and Construction

At the time this report was prepared (April 2008), the Czech Republic was in the process of designing and preparation for construction of SFSF Temelin. The information provided in the following sections are related to this nuclear facility and based on the submitted safety analyses evaluated by SÚJB and supported by operating experience of conceptually similar storage facilities at NPP Dukovany.

7.4.1. *Personal Exposure Evaluation for SFSF Operation*

The personal exposure evaluation is based on the estimated effective doses from external wholebody exposure of individuals involved in the operation of the storage facility. In view of the used cask parameters (absorbed dose rate on the cask cladding surface and at distance of 2 m, the average effective dose will be lower than 20 mSv/year for the radiation personnel).

7.4.2. *Evaluation of Radiation Effects on the Environment and Critical Group of Population*

The enveloping concrete structure of SFSF Temelin storage area is used for radiation shielding against the stored SF casks. The wall thickness is 60 cm that ensures the absorbed dose rate equivalent behind the shielding wall to be less than 2.5 μSv/hr, or not greater than 0.5 μSv/hr on the boundaries of the controlled area (fencing).

For the critical group of the population from the nearest municipalities located 2.5 - 3 km from the expected source, the effective dose rate may be estimated app. 10-11-10-10 Sv/hr and the resulting effective dose about 10-6 Sv/year. It is obvious that the dose rate contribution of the storage facility as ionizing radiation source is quite fractional and far lower than the contribution of natural sources as well as considerably lower than the regulatory exposure limits and guidance values.

7.4.3. *Radiation Monitoring*

SFSF Temelin is a nuclear facility by wording of the Act No. 18/1997 Coll. The scope and method of radiation monitoring at SFSF Temelin ensures the compliance with the obligations imposed on the holder of the license to use a nuclear installation.

The radiation monitoring shall cover the following:

- workplace monitoring,
- personal monitoring,
- discharge monitoring, and
- environmental monitoring.

The existing environmental radiation monitoring system of NPP Temelin encompassing all environmental components shall be used in full scope for environmental monitoring. The construction of SFSF Temelin does not have any impact on the scope and number of environmental radiation measurements outside of NPP Temelin. On the NPP site, SFSF Temelin may only affect the number or locations of environmental sampling during the construction and operation of the storage facility.

7.4.4. *Emergency Preparedness*

Any emergency in the planned SFSF Temelin shall be covered by the emergency preparedness system of NPP Temelin.

7.4.5. *Safe Decommissioning Concept*

Immediate dismantling is proposed for SFSF Temelin to be completed in one stage. At the start of decommissioning, no SF and liquid RAW will be kept in SFSF Temelin (removed to DGR) and the building surfaces and technological equipment contamination will not exceed the clearance levels. By conservative estimate, the storage facility at the time of its decommissioning will contain empty and decontaminated casks that are returned after SF removal and do not comply with the clearance levels. In this case, the decommissioning of SFSF Temelin will be completed by decommissioning of nuclear facility with limited use for other radiation practices. Another alternative is that no empty casks returned after SF removal will be kept in the storage facility. If measurements have verified that clearance levels are met, SFSF Temelin may be used without any restrictions after its decommissioning.

7.5. Assessment of Safety of Facilities

7.5.1. Nuclear Power Plant Dukovany

7.5.1.1. SF Pools

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

Based on ČSKAE decision No. 154/1991, and other SÚJB requirements or the general international recommendations, the safety report was prepared for NPP Dukovany in 1994, documenting in a comprehensive manner the satisfactory state of nuclear safety assurance of EDU production units. The report referred to as Operational Safety Report for EDU Unit 1 was based on the original EDU Final Safety Analysis Report and many of its amendments. With SÚJB advice, the safety report structure was based on the document "Typical content of technical grounds for safety - safety report - nuclear power plants", published in “Safety of Nuclear Installations No. 5/1988”. Based on these documents, SÚJB issued its decision No. 197/95 (license to operate Unit 1 after ten years) on August 21, 1995.

Consequently, the Operational Safety Report sections specific for EDU Units 2, 3 and 4 were developed and reviewed by SÚJB to issue the licenses to operate. In view of the terminology used by the new Czech legislation, the Operational Safety Report was renamed in 1998 on SÚJB request and referred to as EDU Final Safety Analysis Report, Revision 1 within regular updates submitted to SÚJB.

The SÚJB decision to renew the license to operate the nuclear units of NPP Dukovany for another ten years after 2005 was subject to the review of Pre-operational Safety Case based on US NRCstandard RG 1.70 requirement. In 2005 and 2006, the process of periodical safety assessment after 20 years of operation was completed at NPP Dukovany in compliance with new requirements of IAEA NS-G-2.10 guidance. In 2007, final reports were prepared for all fourteen areas of evaluation, including the fresh and SF management and storage.

7.5.1.2. ISFSF Dukovany

The Final Safety Analysis Report, Revision No. 1 of July 1995 was part of the prime basis for SÚJB authorization of ISFSF Dukovany comissioning. The authorization 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 authorization for continuous operation of ISFSF Dukovany.

ISFSF Dukovany is currently operated according to Revision No. 3 of the Final Safety Analysis Report from January 2000, which supported the SÚJB decision to issue an authorisation for extended operation of ISFSF Dukovany until 31 December 2010.

7.5.1.3. SFSF Dukovany

At December 31, 2007, SFSF Dukovany operated in the trial mode. The SÚJB commissioning authorisation was based, amongst others, on the Final Safety Analysis Report, Revision 1 of September 2006. The commissioning authorisation was issued for a period until December 31, 2008 where the minimum duration of commissioning must 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.

7.5.2. Nuclear Power Plant Temelín

Identical to SF pools at NPP Dukovany, SF pools are part of the main production buildings; therefore their safety is evaluated within the safety documents for NPP Temelin.

7.5.3. ÚJV Řež a. s.

7.5.3.1. Building 211/7 - SF Storage Facility

The safety evaluation is provided in the Final Safety Analysis Report for LVR – 15 reactor, No. ÚJV 11783 T of June 2002. In 2004, Pre-operational Safety Case was revised in sections not directly related to Building 211/7.

A wet accumulator tank and Pool A of the SF storage facility are used to handle irradiated fuel in a decay period before its transport to the HLW storage facility. Both in the accumulator tank and in Pool A, FAs are placed in a storage grid which ensures subcriticality of the system. The storage environment is demineralized water with the parameters similar to those prescribed for the primary circuit.

7.5.3.2. Building 211/8 - HLW Storage Facility

7.5.3.2.1. HLW Storage Tank

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 keff = 0.459 ± 0.016. For the optimum moderation pool keff = 0.737 ± 0.017.

The heat output of SF storage is determined for Pool B in the HLW storage facility under a shielding water layer. The total heat output of SF store was identified from 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, with the following expected parameters:
  - IRT Fuel – 2M, 4-tube FA, enrichment 36 % wt. 235U, burn-up rate 60 % (180 MWd/kg),
  - IRT Fuel – 2M, 4-tube FA, enrichment 80 % wt. 235U, burn-up rate 55 % (350 MWd/kg),
  - EK 10 Fuel, enrichment 10 % wt. 235U, burn-up rate 45 %.

7.5.3.2.2. Storage Equipment in the Facility

A calculation of undercriticality for the newly developed storage installation (storage safe), with the maximum capacity of 7 baskets with EK-10 FAs, was made as a part of documents for reconstruction or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness of a nuclear installation or workplace in category III or IV, in respect to the high-level waste storage facility in bldg. 211/8, in agreement with Section 9 paragraph 1 letter f) of Act No. 18/1997 Coll. The calculation was made for seven baskets in the storage safe with 36 hermetic cases in each basket, while one case contains no more than 19 fuel rods from EK-10 FAs. This configuration is optimal in terms of a potential occurrence of criticality. Similarly as in case of the high-level waste storage tank, MCNP 4C program and a set of libraries with effective cross-sections DLC–200 has been used for the calculation. The resulting value was keff = 0.06195 for the basket and keff = 0.06776 – 0.07159 for the storage facility, depending on tolerance of the basket wall thickness, boron concentration in the basket material (ATABOR), fuel weight and enrichment and Mg content in the matrix. The submitted documents also included evaluation of structural integrity of the SF, provision of heat removal and radiation protection.

In connection with the second reconstruction of HLW storage facility, including the construction of storage annex for 16 pcs of Škoda VPVR/M casks, the safety documentation referred to subcriticality assessment of SF in casks as documented in the cask type approval process. All the calculations were conservative for fuel with the maximum multiplication capacity, i.e. fresh fuel without burn-up. Subcriticality was documented for EK-10 fuel type, IRT-M, S-36, VVR-M and TVR-S fuel type subalternatives, and for:

- water density variations inside the cask,
- water flushing in case of emergency,
- each temperature mode during transport and accident,
- each production tolerance (fuel element movement inside the storage basket, total fuel weight U variance, fuel enrichment U variance, fuel matrix weight ratio variance, or active fuel length variance).

The determined keff value varies from 0.3512 to 0.759, therefore subcriticality margin of at least 0.05 during transport and storage of SF for the expected operating or emergency conditions is assuered.

7.6. Operation of Facilities

7.6.1. Nuclear Power Plant Dukovany

7.6.1.1. SF 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 have been elaborated for them or limits and conditions for safe operation; all these issues have been addressed within the operation of reactor units.

The operation of the pools is governed by a number of operating procedures, e.g.:

- P026 Cooling system for storage pool water,
- P186j Fuel handling in the core, storage pool and cavity No. 1

Also the limits and conditions for safe operation of reactor units shall apply for the operation of SF pool and establish in respect to SF pool requirements for:

- level , temperature and concentration of H_3BO_3 in the storage pool,
- the cooling system of the storage pools.

7.6.1.2. ISFSF Dukovany

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. From September 1995 all tests were performed and final adjustments of the facility, 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 approval.

At December 31, 2007, the storage capacity of ISFSF Dukovany was fully used, i.e. 5040 SF assemblies were stored in 60 CASTOR-440/84 casks. The number of loaded cask since 1995 is trended in Chart 7.1.

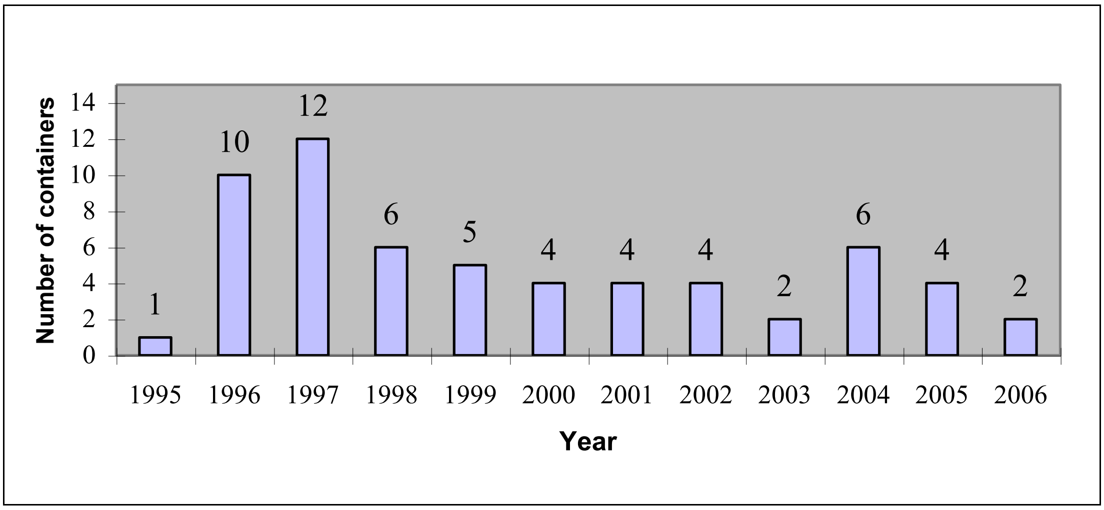


Chart 7.1 Annual increase of number of loaded casks stored in ISFSF Dukovany

The increased number of stored casks in ISFSF Dukovany in 1996 – 1997 is due to the reimportation of 1176 SF assemblies produced in NPP Dukovany and temporarily stored in ISFSF Jaslovské Bohunice in the Slovak Republic. For the last cask with SF imported from ISFSF Jaslovské Bohunice and filled with SF only partly, a test for re-flooding of the cask was tested.

After the controlled flooding of the cask the fuel was added from SF pool and the cask was placed in ISFSF Dukovany in a standard manner. The equipment for re-flooding is a standard accessory for CASTOR-440/84 cask at NPP Dukovany and its use was at the time worldwide unique.

The operation of ISFSF Dukovany is performed in agreement with the operating procedure P181j, while all conditions shall be observed as specified in the resolutions issued by SÚJB and in operational limits and conditions for ISFSF Dukovany, also approved by SÚJB.

There is available detailed information on:

- maximum number of casks in the storage hall of ISFSF Dukovany,
- geometric arrangement of casks in the storage hall of ISFSF Dukovany,
- maximum temperature on the cask surface,
- tightness of casks,
- radiation monitoring of casks,
- moving of casks for fuel assemblies into the main production building,
- anti-fire system devices,
- provision of supply and outlet of the ventilation air in the hall of ISFSF Dukovany,
- organizational measures (responsibilities of managers, inspections and supervision and reporting duty).

7.6.1.3. SFSF Dukovany

The construction of SFSF Dukovany started in April 2004 after the authorisation procedure. In February 2006 the construction was completed and approved by the local competent building authority. Since November 2006 the storage facility has been in trial operation when all the design assumptions are being verified similar to ISFSF Dukovany. No major non-nominal conditions have occurred at the date of this Report. In April 2008 SÚJB finished an administrative procedure to issue the operational license of the facility.

At December 31, 2007 three CASTOR-440/84M casks (one in 2006 and the next two in 2007) were placed in SFSF Dukovany. Five CASTOR-440/84M casks are scheduled for loading in 2008.

7.6.1.3.1. Monitoring, Inspections, Tests and Maintenance at SFSF Dukovany

- Radiation Monitoring

The radiation monitoring system is designed for on-site and environmental radiological monitoring of SFSF Dukovany with the purpose to regulate the presence of individuals in the environment with ionizing radiation and to document the minimum impact of the selected storage technology on the personnel, public and the environment. The radiation monitoring system of SFSF Dukovany is almost identical to ISFSF Dukovany, similar to the environmental radiation monitoring system.

The radiation monitoring control room receives the information on:

  - cask surface temperature increase,

– cask pressure increase, or loss,

– exceeding of neutron dose rate and gamma radiation limits,

– exceeding of volume activity and noble gas limits, and

– storage process equipment failures (electrical, I&C, etc.).

- System Measuring Pressure Between the Packing Lids

The purpose of this system is to provide local and remote, i.e. the central radiation monitoring control room, information on helium pressure in the space between two lids of each cask. This data are used to identify the cask tightness and take the necessary measures.

The following indication levels are set up in the pressure measurement system:

– warning level 0.45 MPa,

– action (intervention) level 0.35 MPa.

- System Measuring Temperature on the Packing Surface

Each cask placed in the storage hall is provided with a temperature sensor and the cask is wired to the monitoring system.

The following indication levels are set up in the temperature measurement system:

– warning level 85°C,

– action (intervention) level 100°C.

- Periodic Inspections of Pressure Sensors in the Packagings

According to the Metrology Act and its related regulations, the helium pressure sensor between two lids of the cask is identified as a working meter. In agreement with the metrology rules of NPP Dukovany, such a meter is subject to periodical testing. The testing period for cask pressure sensors is 12 years.

- Periodic inspections of Trunnions on the cask

Periodical testing of cask trunnions is performed every 3 years.

- Periodic Inspections of Trunnions’ Bolts on the Cask

Periodical testing of cask pressure sensors includes trunnion clamping bolts due to potential corrosion.

- Other Inspections and Maintenance at SFSF Dukovany

In SFSF Dukovany, miscellaneous equipment testing, inspections and maintenance comply with the revised operating procedure P181j. Special attention is deserved to the use of a newly developed air mass activity monitor from the SF cask drying system (AAM/AS). This system performs monitoring of FA integrity (air-tightness) during the cask drying process as well as monitoring of the released air with respect to its activity.

7.6.1.3.2. Waste Management at SFSF Dukovany

RAW are not produced at SFSF Dukovany during normal operation, or design basis accidents. This is based on the selected SF storage technology.

The total annual production of solid waste is about 3 m^3. This waste may only be removed from SFSF Dukovany after contamination survey and subject to approval of the radiation monitoring personnel. The waste is further disposed in agreement with Act No. 185/2001 Coll., on waste, as amended.

Cleaning of floors and all casks placed in SFSF Dukovany may produce app. 15,5 m^3 liquid waste every year, which is stored in waste water tanks of the volume 4 m3. A sample is collected from each filled tank and measured by gamma spectrometry and after evaluation, the tank is either discharged into the sewerage system, or transferred to the reactor building for discharge into special drainage system, i.e. for treatment and consequent controlled discharge and for active residues disposal in RAW repository Dukovany.

7.6.1.3.3. Engineering and Technical Support of SFSF Dukovany Operation

Technical and human resources of NPP Dukovany are used to support the operation of SFSF Dukovany. It is one of the major advantages with respect to the selected location of SFSF Dukovany. Some tasks associated with the operation of SFSF Dukovany are also performed by the NPP contracted technical support of research organizations.

7.6.1.3.4. Monitoring and Evaluation of Events during SFSF Dukovany Operation

In agreement with the legislative requirements, NPP Dukovany has developed a system for investigation of operational occurrences and a system to share the external operational experience. These systems are related both to the operation of reactors units and SFSF Dukovany.

The operational occurrence investigation system is explained in the EDU internal procedures.

7.6.1.3.5. Regular Evaluations of SFSF Dukovany Operation

In 2007, SÚJB supervision activities included one planned inspection together for ISFSF and SFSF Dukovany. In agreement with the technical specifications for safe operation of ISFSF and SFSF Dukovany, the operator provides continuous monitoring of the basic physical parameters such as pressure between the primary and secondary lid of each cask of either used type, dose equivalent rate in connection with mapping of the radiation situation in the storage facilities and their vicinity, and in addition to the approved technical specifications, the surface temperature of all casks in storage. The measured values comply with the values approved by SÚJB as technical specifications for continuous operation of ISFSF Dukovany and for trial operation of SFSF Dukovany. In addition to the monitored physical parameters, the trunnion clamping bolts have also been monitored since 2004 to ensure long-term safe handling of casks throughout the scheduled time of storage.

When a loaded CASTOR-440/84M cask is being prepared for transport to SFSF Dukovany, the SF condition is continuously monitored using the AAM/AS system designed to monitor the cask drying process at the service point in HVB and identify any failed fuel assemblies in ŠTK. If the air mass activity limit should be exceeded, the system will shut down the drying process. The system will detect the specific activity of noble gases, ^{137}Cs a ^{60}Co, in air mass when drying the inner content of CASTOR-440/84M cask in HVB, and in case of a failed FA, it is identified after cask return to ŠTK. In 2006, SÚJB inspection was performed and verified the functionality of the whole system when loading the first CASTOR-440/84M cask.

With respect to SÚJB requirement, the nuclear power plant will prepare a report on the operation of ISFSF Dukovany and SFSF Dukovany once a year and submit it to SÚJB. The report provides summary evaluation of the operation of ISFSF Dukovany and SFSF Dukovany for the past calendar year, including a list and results of SÚJB supervision activities.

7.6.1.3.6. Concept for Decommissioning of SFSF Dukovany

Pursuant to Atomic Act, the construction license documentation of SFSF Dukovany also includes a draft concept for safe decommissioning, including RAW disposal. The method and process of decommissioning are set forth in the implementing Decree No. 185/2003 Coll., on decommissioning of nuclear installations or Category III or IV workplaces.

Safe storage will be ensured for SF in SFSF Dukovany before it may be declared as RAW in accordance with the Atomic Act. Consequently, the responsibility will be transferred to SÚRAO to ensure its safe disposal in compliance with the current Policy.

7.6.2. Nuclear Power Plant Temelín

Identical to NPP Dukovany, SF pools in NPP Temelin are partial process facilities of reactor units and as such they do not require individual licenses for operation, nor individual safety reports, or technical specifications for safe operation, but all these issues are addressed within the operation of reactor units.

The operation of SF pools is regulated by the operating procedure 1(2)T045 “Spent fuel pool cooling system“. The SF pools are also subject to the technical specifications for safe operation as provided in TL001 (chapter A.3.9), with the following requirements set with respect to SF pools:

- H_3BO_3 level, temperature and concentration in storage pools,
- cooling circuit operability in the storage pool cooling system,
- measures to prevent the formation of pure condensate.

7.6.3. ÚJV Řež a. s.

7.6.3.1. Bldg. 211/7 - SF Storage Facility

The SF storage facility is part of LVR-15 reactor, 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., or working procedures for LVR-15 reactor working place.

7.6.3.2. Bldg. 211/8 - HLW Storage Facility

Relative to extensive reconstruction of the high-level waste storage facility, the below listed documents are effective on December 31, 2007:

- Technical specifications for operation of high-level waste storage facility (Building 211/8) during operation of the hot chamber, HK EK-10, Ref. DPP 300.24, System No. 28.00.00,

- Edition 7, Revision 0, Level II, ÚJV Řež a. s. of December 1, 2006,

- Definition of the radiation controlled area of High-level waste storage facility, Ref. DPP 300.25, System No. 28.00.00, Edition 6, Revision 0, Level II, ÚJV Řež a. s. of December 1, 2006,

- High-level waste storage facility monitoring program, Ref. DPP 300.26, System No. 28.00.00, Edition 6, Revision 0, Level II, ÚJV Řež a. s. of November 30, 2006,

- Internal emergency plan of high-level waste storage facility, Ref. DPP 300.27, System No. 28.00.00, Edition 4, Revision 0, Level II, ÚJV Řež a. s. of December 1, 2006,

- Decommissioning proposal for high-level waste storage facility (Building 211/8), Ref. DPP 300.11, System No. 28.00.00, Edition 2, Revision 0, Level II, ÚJV Řež a. s. of September 15, 2006,

- Quality assurance program, Commissioning after reconstruction of the high-level waste storage facility, Ref. PZJ 300.10, System No. 40.00.00, Edition 1, Revision 1, Level II, ÚJV Řež a. s., of December 1, 2006,

- List of classified equipment, High-level waste storage facility reconstruction – Building 211/8, No. 4.4.2/315, Edition 1, Revision 2, ÚJV Řež a. s. of December 19, 2006.

- In-service inspection program for high-level waste storage facility (Building 211/8), Ref. DPP 300.31, System No. 28.00.00, Edition 1, Revision 0, Level III, ÚJV Řež a. s. of December 1, 2006.

7.6.3.2.1. Monitoring, Inspections, Tests and Maintenance in the HLW Storage Facility

- Radiation Monitoring

The radiation monitoring system of the HLW storage facility as described in the monitoring program includes:

  - monitoring of workplaces with ionizing radiation sources,
  - personal monitoring,
  - aerosol monitoring ,
  - environmental monitoring.

- Monitoring in the Pool B

For shielding of fuel assemblies stored in Pool B of the high-level waste storage facility and personal radiation protection, the shielding water level and its volume activity are continuously monitored in agreement with the technical specifications and the in-service inspection program for the facility. Moreover, the pool, water circulation and purification system, the specific water conductivity, pH and temperature and Cl, Al, Fe and Cu ion concentration are monitored to minimize corrosion of fuel assemblies.

- Monitoring of the MIX 1000 Demistation

To ensure the required quality of shielding water, some parameters of the MIX 1000 demineralized water station are monitored, in particular the maximum conductivity at the outlet from the station, and ion exchangers are regenerated at the same time.

7.6.3.2.2. Waste Management in the HLW Storage Facility

Under normal operating conditions no significant quantity of RAW is generated in the storage facility. The MIX 1000 demineralization station includes a sump for liquid RAW comprising particularly waste from ion exchanger regeneration and rinsing water. The liquid RAW is pumped from the sump into a transport tank to be moved to the facility Velké zbytky, where it is treated with other liquid RAW.

7.6.3.2.3. Regular Evaluations of Operation of the HLW Storage Facility

In the scope of supervisory activities, SÚJB carried out five inspections of the HLW storage facility in 2007. The extended supervision was due to reconstruction of the nuclear installation and SF preparation for RF reprocessing (transport of SF of IRT-2M type from LVR-15 reactor to the HLW storage facility, repacking of EK-10 type SF in the hot chamber). At the same time, the compliance with limits and conditions for safe operation of the hot chamber was checked. The HLW storage facility operator will submit to SÚJB the compliance evaluation of operational limits and conditions on a yearly basis.

7.6.3.2.4. Concept for Decommissioning of HLW Storage Facility

The proposed method of decommissioning for the HLW storage facility is part of the licensing documentation for a nuclear installation in accordance with Annex to Act No. 18/1997 Coll., Point D, letter b), paragraph 9. The method and process of decommissioning are specified in Decree No. 185/2003 Coll.

The HLW storage facility has been in operation since 1995 and its planned life is 50 years. Thus, decommissioning should take place in about 2045. The process is envisioned to be single-stage with dismantling while the storage building may be used for other purposes.

Decommissioning of the HLW storage facility will be preceded by removal of all RAW, SF and surveillance samples. Consequently, removal and treatment of cooling water and ion exchangers from the water treatment station, monitoring of the radiation situation in the storage, surface decontamination, dismantling of pipe lines, valves and process equipment, and RAW fragmentation and decontamination followed by treatment and disposal will be completed. The last step will be the transport of non-contaminated waste and waste contaminated below the environmental release limits. It is expected that 15 drums, 200 l each, are produced for disposal during decommissioning of the storage facility.

7.7. Disposal of SF

The Czech Republic expects to construct a DGR in granitic rock formations after 2065. Based on previously collected geological data, 30 potential locations were identified in the Czech Republic.

The repository is expected to accommodate all RAW that cannot be disposed in near-surface repositories, SF designated as RAW, and alternatively HLW from potential SF reprocessing at NPP Dukovany and NPP Temelin, or SF and HLW from other nuclear sources. Four units of NPP Dukovany will generate a total quantity of 1940 t of heavy metal and two units of NPP Temelin will generate 1370 t of heavy metal for the planned operation of all the units.

In 1998 – 1999, alternative disposal was considered for SF as non-dismantled in non-shielded casks within the program „Reference Project of Surface and Underground Deep Repository Systems in Host Environment of Granitic Rock Formations for Agreed Composition of Initial Design and to Depth of

Design Study". As explained in the project, disposal casks should be wrapped into a bentonite layer and placed vertical in granite massif tunnels, about 500 m under the surface part of DGR.

During geological survey relating to DGR development, the mayors and public of the affected municipalities in the considered locations strongly opposed against potential location of DGR. For this reason, MPO and SÚRAO agreed and the government approved to discontinue geological survey in the locations until 2009.

8. SAFE RADIOACTIVE WASTE MANAGEMENT

8.1. General Safety Requirements

In connection with the effort to minimize generation of RAW the Atomic Act in Section 18 paragraph 1 letter d) positively requires to keep generation of RAW and SF to the minimum necessary level.

A holder of a license to manage RAW submits once a year to SÚJB a document containing evaluation of RAW management, which includes proposed improvements (to minimize generation of RAW) and their implementation. The key method for minimization of RAW products consists in their collection, segregation and use of effective separation methods.

Mutual links between the individual steps of waste management are described in Sections 46 – 55 Decree No. 307/2002 Coll., as amended by 499/2005 Coll. The document defines the basic principle saying that no activity in any individual step of RAW management shall adversely influence activities that follow thereafter.

The Czech legislation in radiation protection has been developed based on internationally recognized standards and criteria. The legislation is based on safety standards IAEA Safety Series 115 and EU legislation- Directive No. 96/29/Euratom. Three fundamental pillars of radiation protection have been employed – optimization, justification and limitation and these have been integrated into the Atomic Act and Decree No. 307/2002 Coll., as amended by 499/2005 Coll. on radiation protection. This is documented by the requirements in Section 46 paragraph 2 of Decree No. 307/2002 Coll. as amended by 499/2005 Coll., saying that: *" For radioactive waste management, radiation protection shall be ensured in the same way and scope as for other radionuclide sources unless expressly specified otherwise in a license."* In the Czech Republic no RAW management shall be permitted without license (Section 9 of the Atomic Act) issued by SÚJB.

Concerning the requirement to avoid actions that impose practical impacts on future generations or impose undue burdens on future generations, provision of Section 4 paragraph 2 of the Atomic Act says that: *„Whoever utilizes nuclear energy or performs radiation practices or interventions to reduce natural exposure or exposure due to radiation incidents must ensure that his or her action is justified by the benefits outweighing the risks arising or liable to arise from these activities."*

One example of application of this provision is the provision of Section 52 paragraph 6 of Decree No. 307/2002 Coll., as amended by 499/2005 Coll. saying that "The dose constraint for safe disposal of radioactive waste shall be an effective dose of 0.25 mSv per calendar year and individual from the critical group of the population.“ Also all requirements for safe management of ionizing radiation sources shall apply to RAW management.

8.2. Existing Facilities and Past Practices

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 Act No. 28/1984 Coll., on state nuclear safety supervision of nuclear installations, and it’s 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 Atomic Act. 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.

EDU now includes the following technology systems for RAW management:

- systems for treatment of liquid radioactive media,
  - treatment plant for SF pool water SVO 4,
  - treatment plant for boric acid SVO 6,
  - treatment plant for wastewater SVO 3.
  - a subsystem of sedimentation, emergency and overflow tanks designed for accumulation and storage of waste water in order to separate mechanical impurities (by sedimentation) before treating them on an evaporator,

The systems are common for reactor units 1 and 2 (HVB I), and for units 3 and 4 (HVB II).

The aim of liquid RAW treatment is to concentrate radioactive substances contained therein to the minimum volume possible. A fraction of the original content of radioactive substances passes to the treated media that are recycled in the controlled area of NPP Dukovany.

- Systems for RAW management:
  - Systems for storage of liquid RAW,
    - a subsystem of tanks with active RAW concentrate, designed to store concentrated liquid waste resulting from wastewater treatment on the evaporator,
    - a subsystem of storage tanks for radioactive sorbents to store spent ion exchangers.

The subsystems may operate independently or in mutual cooperation. Each subsystem is common for the reactor units 1 and 2 and for units 3 and 4.

– Systems for conditioning of liquid RAW:

Systems for conditioning of liquid RAW consist of the process equipment of the operating unit “Bituminization”. The system is common for all four reactor units. In the “Bituminization“ operating unit liquid RAW (radioactive concentrate) is immobilized in bitumen, i.e. into a form suitable for disposal. The main process equipment is a film rotor evaporator where the concentrate is mixed with bitumen and water is evaporated. The resulting product is filled into 200-liter drums. The drums are transported on a conveyor. Once a drum is filled and cooled, it is covered with a lid by a manipulator, removed from the conveyor and placed into the handling area.

– – Systems for collection, storage and conditioning of solid RAW.

Collection, storage and treatment of solid RAW are situated in the BAPP building and consists of 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 are stored in box pallets, i.e. low-pressure compacted in 200 l casks.

A part of solid RAW suitable to be cleared into the environment 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.

The waste which meet criteria specified in Decree No. 307/2002 Coll. as amended by 499/2005 Coll. are cleared into the environment without any SÚJB permit, to the dump for solid municipal waste Petrůvky.

8.2.2. Nuclear Power Plant Temelín

Safety assessment of all facilities for RAW management was performed at ETE in agreement with the safety requirements specified for these facilities in the 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. At the same time a license was issued for RAW management under Section 9 paragraph 1 letter j) of the Atomic Act. Operability and safety of the facilities for RAW management is regularly monitored and evaluated by the operator.

The following technology systems for RAW management are now situated at ETE in BPP:

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

8.2.2.1. System of Treatment of Liquid Radioactive Material

It includes:

- treatment plant for SF pool water SVO 4,
- treatment plant for impure condensate SVO 6,
- treatment plant for wastewater SVO 3.

The aim of liquid radioactive media treatment is to concentrate radioactive substances contained therein to the minimum volume possible. A fraction of the original content of radioactive substances passes to the treated media that are recycled in the controlled area of NPP Temelín.

8.2.2.2. System of Storage and Conditioning of Liquid RAW

The system for storage and conditioning of liquid RAW includes an interim storage for liquid RAW consisting of:

- technological node of tanks with sorbents,
- technological node of tanks with concentrate,
- technological node of concentrate solidification.

The interim storage of 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 BPP, another technological node includes tanks with concentrate containing radioactive concentrate from SVO 3 evaporators, as well as radioactive sludge from SVO 3 centrifuge. The technological node for solidification of liquid RAW carries out immobilization of concentrated forms of liquid RAW in bitumen into a 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 on several more positions and the product cools down. Then it is covered with a lid, taken down from the carousel by a swiveling manipulator and on a track platform moved into the handling space.

Sludge and ion exchangers are treated by immobilization in aluminosilicate matrix using a portable device and SIAL® technology.

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

It includes:

- segregation and fragmentation workplace,
- storage of solid RAW.

A part of the solid RAW from ETE, which meets requirements under Decree No. 307/2002 Coll., as amended by 499/2005 Coll. is cleared into the environment based on a SÚJB permit and the remaining solid RAW from the main production unit is processed, treated and stored in BPP.

8.2.3. SÚRAO

Safety of repositories is demonstrated by compliance with the basic limits for radiation protection. The limits to be observed are the annual effective dose equivalent for the workers at 20 mSv and annual effective dose equivalent for individuals from a critical group of population at 250 μSv/y.

All this is demonstrated in documents supporting the application for a license to operate a repository (particularly in safety analyses from which operational limits and conditions for the repository operation are derived) under Section 9 paragraph 1 letter d) of the Atomic Act and in documents supporting the application for a license to manage RAW under Section 9 paragraph 1, letter j) of the same Act. Before issuing the licenses SÚJB verifies compliance of the actual status with the documents by inspections.

8.2.3.1. RAW Repository Richard

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

Since 1964 the repository 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 repository is checked by a monitoring system in agreement with a monitoring program approved by SÚJB. The method of the repository closing has been assessed by safety analyses.

In the period of 2005-2007, a pilot project of application of so-called “hydraulic cage“ was completed in RAW repository Richard. This technical solution was applied for RAW with the longest term of disposal in RAW repository Richard (see Fig. 4.6.). Free chambers were converted to accommodate about 16 000 waste disposal units. This project demonstrated the capability to fill up tightly the space between waste disposal units. Based on the project results, the work is currently in process to develop an optimized version of so-called “hydraulic cage” where the waste disposal units disposed prior to the implementation of “drum in drum” disposal units are relocated.

Based on the 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 repository has been operated based on a license issued by SÚJB.

Fig. 8.1 View of Vault in RAW repository Richard

8.2.3.2. RAW Repository Bratrství

The repository is designed exclusively for waste containing natural radionuclides.

Fig. 8.2 View of Vault in RAW repository Bratrství

The repository 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 m^3. The repository 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 repository 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 repository has been operated based on a license issued by SÚJB.

8.3. Operation of Facilities

The legislative framework for the license to operate RAW repositories and facilities for RAW management in nuclear installations from the viewpoint of nuclear safety and radiation protection consists of theAtomic Act and its implementing regulations.

As stated in chapter 5.2.2, the commissioning and operation of RAW repositories and RAW management facilities in NIs are activities subject to the SÚJB license under Section 9, paragraph 1, letters c) and d) of the Atomic Act. A precondition of such licenses for commissioning and operation of a nuclear installation under Section 13, paragraph 5 of the Atomic Act is an approved quality assurance program, method of physical protection assurance for the nuclear installation and nuclear materials and on-site emergency plan.

RAW repository and RAW management facilities in nuclear installations are commissioned gradually, starting with a trial operation for which the applicant shall submit documents prescribed by Atomic Act.

An application for a operational authorisation shall be supported under Appendix D of the Atomic Act with safety documents.

After the above-mentioned documents are favorably assessed SÚJB will issue a license for operation of a NI, while changes in the documents approved in the earlier stages shall be approved by SÚJB separately. The operational limits and conditions for safe management of RAW, which is a document to be approved under J.9 Appendix to the Atomic Act, shall be established based on safety analyses and under Section 53 of Decree No. 307/2002 Coll. as amended by 499/2005 Coll. shall include particularly the following:

- data on the permissible parameters which assure nuclear safety and radiation protection of the management,
- methods and times of their measurement and evaluation,
- requirements for operating capability of the facility for RAW management,
- requirements for setup of protection systems of the facility,
- limits of the conditional quantities,
- requirements for activities performed by workers and organizational measures to meet all defined conditions for the design operating situations.

RAW may be managed only by a licensee under Section 9 paragraph 1 letter j) 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 1 letter i) for management of sources of ionizing radiation.

8.3.1. Nuclear Power Plant Dukovany

EDU is a holder of the license for RAW management under Section 9 paragraph 1, letter j) of the Atomic Act. This means that all requirements have been met for safe management of RAW as specified in the Atomic Act and its implementing regulations, particularly Decree No. 307/2002 Coll. as amended by 499/2005 Coll.

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

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 EDU the procedures for characterization and sorting of RAW are described in the internal regulations inspected by SÚJB. The regulations comply with the requirements of Decree No. 307/2002 Coll. as amended by 499/2005 Coll. for sorting and characterization of RAW.

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

Programs for accumulation and analyses of significant operating experience are used in EDU in all operating areas, 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 EDU, which concentrated on compliance with operational limits and conditions for safe RAW management and on compliance with Sections 48 – 51 and 53 – 55 of Decree No. 307/2002 Coll. as amended by 499/2005 Coll. on radiation protection. Results of the inspections did not indicate 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 Decree No. 185/2003 Coll. Meanwhile, the costs of decommissioning are verified and EDU is creating a financial reserve for the decommissioning. A proposal for decommissioning is under Decree No. 185/2003 Coll. approved for five years. Also the verification of decommissioning costs is valid for the same period of time. The proposal for decommissioning also includes facilities for RAW management.

8.3.2. Nuclear Power Plant Temelín

ETE is a holder of the license for RAW management under Section 9 paragraph 1, letter j) of the Atomic Act. This means that all requirements have been met for safe management of RAW as specified in the Atomic Act and its implementing regulations, particularly Decree No. 307/2002 Coll. as amended by 499/2005 Coll.

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

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 ETE the procedures for characterization and sorting of RAW are described in the internal regulations inspected by SÚJB. The regulations comply with the requirements of Decree No. 307/2002 Coll. as amended by 499/2005 Coll. for sorting and characterization of RAW.

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

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

In each of the years three inspections of RAW management were conducted at ETE which concentrated on compliance with operational limits and conditions for safe RAW management and compliance with Sections 48 – 51 and 53 – 55 of Decree No. 307/2002 Coll., as amended by 499/2005

Coll., on radiation protection, and on compliance with requirements of Decree No. 132/2008 Coll. on quality assurance. Results of the inspections did not indicate 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 Decree No. 185/2003 Coll. Meanwhile, the costs of decommissioning are verified and ETE is creating a financial reserve for the decommissioning. The proposal for decommissioning is under Decree No. 185/2003 Coll. approved for five years. Also the verification of decommissioning costs is valid for the same period of time. The proposal for decommissioning also includes facilities for RAW management.

8.3.3. SÚRAO

8.3.3.1. RAW Repository Richard

The repository's safety has been assessed using requirements of Act No. 28/1984 Coll. and its implementing regulations and subsequently in agreement with Atomic Act No. 18/1997 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 repository took into account also Section 34 paragraph 1 of Act No. 44/1988 Coll.

The repository is operated in a standard manner in agreement with the operating regulations, with the limits and conditions for safe operation with the acceptability 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 repository entrance and in the retaining 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.

8.3.3.1.1. Volume activity of ^{3}H Radionuclide in the atmosphere

The volume activity of ^{3}H has been monitored in three points in the repository and the in 2007 measured activity was $1{,}3.10^{3}$ Bq/m^{3} in front of room no. 18. The limit volume activity for the repository atmosphere is 3.10^{4} Bq/m^{3}.

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

Average EOAR levels are considered separately for premises with increased radon concentration and for other premises. Limit EOAR values are specified at 3000 Bq/m^{3} in locations with increased radon concentration and at 1500 Bq/m^{3} in other premises. In the course of 2007 the measured EOAR values ranged from 180 Bq/m^{3} to 43 700 Bq/m^{3} (the maximum values were measured in the regime without the presence of operators and with the ventilation off).

8.3.3.1.3. Maximum intake

The maximum intake for a worker in the course of 2007 was 0.116 MBq, which corresponds to the effective dose 0,78 mSv/year. The annual intake of equivalent volume activity from radon received by the repository workers shall not exceed 3 MBq.

In connection with the limits and conditions for safe operation 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 acceptability criteria valid in the given period. When disposing the waste the operator checks it for the following:

- 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 stored to maximize utilization of the space in the rooms, in 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.

The RAW in which the content of radionuclides exceeds the acceptance criteria for disposal are, in agreement with the operational limits and conditions for storage of RAW, stored in rooms separated from the disposal rooms (this concerns particularly the radionuclides ^{60}Co, ^{137}Cs, ^{241}Am, ^{238}Pu and ^{239}Pu).

Table 8.1 Summary data on RAW repository Richard

Begin of operation	1964
Scheduled end of operation	2070
Repository depth under the surface	70 - 90 m
Total volume adapted for the repository	17 000 m^3
Filled volume	7300 m^3 (the volume of deposited RAW represents 40%)
Free volume	2 200 m^3
Access tunnel and other communications (including that to Richard I)	7500 m^3
Activity converted as in 2007	see chapter 4.2.3.1.

In 2007 two inspections of RAW management were conducted at the Richard repository which concentrated on compliance with operational limits and conditions for safe RAW management, acceptance conditions for disposal and acceptance conditions for storage and on compliance with Sections 52 – 55 of Decree No. 307/2002 Coll. as amended by 499/2005 Coll., on radiation protection. Results of the inspections did not indicate violation of the above mentioned regulations.

8.3.3.2. RAW Repository Bratrství

The repository's safety has been assessed using requirements of Act No. 28/1984 Coll. and its implementing regulations and subsequently in agreement with Atomic Act No. 18/1997 Coll. And it's implementing regulations.

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 ca. 2 m.

Table 8.2 Summary data about the Bratrství repository

Begin of operation	1972
Scheduled end of operation	2030
Repository depth under the surface	over 50 m
Total volume adapted for the repository	3500 m^3 (the anticipated storage layer is 2 m, however it may be mode in rooms no. 1, 4 and 5)
Filled volume	993 m^3 (the volume stored RAW is 298 m^3)
Free volume	207 m^3 (filling ratio 30%)
Access tunnel and other communications (including that to Richard I)	7500 m^3
Activity converted as in 2007	see chapter 4.2.3.2.

The monitoring of the repository, persons, surroundings and effluences is performed in agreement with the monitoring program for the Bratrství repository approved by SÚJB. Inspections in the repository are performed on 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 ^{226}Ra and radon transformation products and air activity from radon transformation products. The air in the repository is monitored based on a contract with SÚJCHBO Příbram – Kamenná. Analyses of discharged water and water samples from the workplace and its surroundings are performed in SÚRO laboratories on a contractual basis. The RAW disposed in the Bratrství repository is mostly RaSO4 in platinum cases (medical sources), Ra-Be neutron sources, laboratory waste containing natural radionuclides, depleted uranium and natural thorium (mostly as $Th(NO_3)_4.5H_2O$ a ThO_2).

The overall inventory of selected radionuclides disposed in the repository shall not exceed 2.10^{12} Bq of natural radionuclides.

In 2007 one inspection of radiation protection was performed in the Bratrství repository.

8.3.3.3. RAW Repository Dukovany

The repository's safety has been assessed using requirements of Act No. 28/1984 Coll. and its implementing regulations and subsequently in agreement with Atomic Act No. 18/1997 Coll. and its implementing regulations.

The limits and conditions for safe operation define conditions in which the repository may be operated:

- the tanks are monitored for presence of water,
- drainage water from inspection tanks is monitored,
- clearness of the drainage system is checked (once a year),
- the instrumentation is checked for operating ability.

The acceptance criteria establish requirements for the form of the disposed RAW, including the activity. The exclusive type of container used in the repository are 200 l drums of zinc-plated sheet which are regularly visually inspected at the receiving inspection of the RAW.

Every receipt of RAW includes evaluation of compliance with activity limits for selected radionuclides.

Table 8.3 Summary data on RAW repository Dukovany

Begin of operation	1995
Scheduled end of operation	2100
Repository depth under the surface	0
Total volume adapted for the repository	55000 m^3
Filled volume	5930 m^3
Free volume	49070 m^3
Activity converted as in 2007	see chapter 4.2.3.3.

In 2007 two inspections of RAW management were conducted at the Dukovany repository which concentrated on compliance with operational limits and conditions for safe RAW management, acceptance conditions for disposal and on compliance with Sections 52 – 55 of Decree No. 307/2002 Coll. as amended by 499/2005 Coll., on radiation protection. Results of the inspections did not indicate violation of the above mentioned regulations.

8.3.3.4. RAW Repository Hostim

The repository was closed based on the performed safety analyses in 1997.

The 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 repository Richard),
- hydrogeologic evaluation of the location,
- evaluation of potential accident scenarios,
- a monitoring system has been created (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 immobilization of the disposed waste. Therefore the repository has been filled with a concrete mixture and closed.

At the moment the repository is in the regime of institutional control. The control has not identified any release of radioactive materials from the repository premises into the environment.

Table 8.4 Summary data on RAW Repository Hostim

Begin of operation	1959	
Scheduled end of operation	1964	
Repository depth under the surface	1997	
Total volume adapted for the repository	about 30 m	
Filled volume	5930 m^3	
	Gallery A	**Gallery B**
Repository volume volume	360 m^3	1220 m^3
Total volume of disposed RAW	1/3 of gallery	200 m^3
Activity converted as in 2007	see chapter 4.2.3.4.	see chapter 4.2.3.4.

8.3.4. ÚJV Řež a. s.

8.3.4.1. Bldg. 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 2006,

- license for operation of workplaces in categories II and III with unsealed sources in the building 241 – Velké zbytky from 2006,

- license for management of sources of ionizing radiation and use of an significant sources of ionizing radiation – radiographic equipment from 2006,

- license for operation of a workplace in category III in the building 241 – Velké zbytky – radiographic workplace with a significant source of ionizing radiation from 2006,

- license for RAW management, which covers collection, sorting, treatment, conditioning and storage of RAW; the license also approves the operational limits and conditions for RAW management ÚJV Řež a. s. from 2004.

Additionally, RAW management in ÚJV Řež a. s. is regulated by the following internal procedures:

- Rules of Organization, Reg. No. Rad 03 (2006),

- Metrological Manual, Reg. No. Rad 01 (2006),

- On-site emergency plan, Reg. No. OSM 16 (2007),
- Monitoring program, Reg. No. OSM 17. (2007),
- System to assure safety and protection occupational risks, Reg. No. OSM 21 (2007),
- Radioactive waste management, Reg. No. OSM 23 (2007),
- Assurance of radiation protection, Reg. No. OSM 25 (2007),
- System of employees training in radiation protection and nuclear safety, Reg. No. OSM 26 (2007).
- • Accounting for ionization radiation sources, Reg. No. OSM 27. (2007),
- • Assurance of emergency preparedness, Reg. No. OSM 28 (2007),
- Assurance of nuclear safety , Reg. No. OSM 29 (2007).

The operational limits and conditions for RAW management have been approved by SÚJB.

8.3.4.2. Bldg. 211/8 – HLW Storage Facility

SÚJB has issued the following licenses concerning operation of the HLW storage facility:

- license for operation of a workplace in category IV with very significant sources of ionizing radiation, i.e. a workplace of the HLW storage facility – Building 211/8 from 2007,
- license for operation of a nuclear installation – a workplace with HLW storage facility at the site of ÚJV Řež a. s. from 2001,
- license to perform reconstruction of the HLW storage facility, building 211/8, including construction modifications and construction of a hot cell, repackaging of EK-10 fuel and
- increase of the pool storage capacity from 2003,
- license to perform reconstruction of the HLW storage facility, building 211/8, including construction of a storage annex, loading of ŠKODA VPVR/M casks with SF and storage of these casks, management of damaged SF from 2007,
- license for management of nuclear material in the HLW Storage facility from 2007.

A resolution issued by SÚJB has approved operational limits and conditions for operation of HLW storage facility (Building 211/8).

<u>Management of RAW and ionizing radiation sources</u>

ÚJV Řež a. s. is a research organization capable of providing engineering and technical support for activities it performs, including RAW management. Some activities have been 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 parameters for sorting of RAW into groups (classes) then determine further processing and selection of methods to process the waste.

Based on the activity level RAW are sorted into temporary, low- and intermediate-level waste and HLW (the last mentioned type is not generated in ÚJV).

Subsequently, the RAW 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 due the activity collected in shielding casks
- liquid, low- and intermediate active RAW,
  - water based,
  - non-water based (e.g. organic solvents, oils, 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 man-made radionuclides.

The system for handling of ionizing radiation sources includes emergency preparedness, which is an ability to recognize occurrence of an extraordinary radiation situation and at its occurrence to perform measures specified by emergency plans. An emergency plan is a set of planned measures to liquidate a radiation accident or radiation emergency and to limit their consequences. The following documents have been elaborated and approved by SÚJB for the mentioned purposes:

- On-site emergency plan ÚJV Řež a. s., Reg. No. OSM 16, Edition No. 5, Revision No. 0, valid from 1 January 2008,

- On-site emergency plan for workplaces of the RAW Management Center, Reg. No. DPP 300.19, Edition No. 3, Revision No. 0, valid from 14 August. 2006,

- On-site emergency plan for operation of HLW Storage facility, Reg. No. DPP 300.27, Edition No. 4, Revision No. 0, valid from 22 January 2007.

Records are kept about the RAW managed in ÚJV Řež a. s., i.e. quantities and specific activities of radionuclides in the waste. Also operating records are kept and maintained on RAW management. The data are regularly once a year sent 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 Quality Assurance Programs:

- Quality assurance program for RAW management, Reg. No. PZJ 300.08, Edition No. 3, Revision No. 0, valid from 14 August 2006,

- Quality assurance program for Commissioning of the HLW Storage Facility after its Refurbishment, Reg. No. PZJ 300.10, Edition No. 1, Revision No. 1, valid from 22 January 2007.

In 2007 two inspections of RAW management, including waste from rehabilitation of old environmental liabilities, were conducted in ÚJV Řež a. s., which concentrated on compliance with operational limits and conditions for safe RAW management and on compliance with Sections 48 – 51 and 53 – 55 of Decree No. 307/2002 Coll. as amended by 499/2005 Coll., on radiation protection. Results of the inspections did not indicate violation of the above mentioned regulations.

<u>Decommissioning Programs</u>

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 300.11, Edition No. 2, Revision No. 0, valid from 22 January 2007,

- Proposed decommissioning method for workplaces in Building 241 "Velké zbytky" (RAW management facility), Cat. No.: 3.9.8 - 4/VZ, Edition No. 1, Revision No. 0., valid from 30 November 2003,

- Proposed decommissioning method for the radiographic workplace, Reg. No. DPP 300.17, Edition No. 1, Revision No. 0, valid from 14 August 2006.

8.4. Institutional Measures after Closure

The state guarantees under the conditions in Section 25 of the Atomic Act safe disposal of all RAW, including monitoring and inspections of repositories even after their closure. Responsibility for the monitoring of repositories is defined in Section 26 paragraph 3 of the Atomic Act, which I, among other things, says: *„The Authority shall engage in preparation, construction, commissioning, operation and closure of radioactive waste repositories and monitoring of their impact on the environment”.*

8.4.1. SÚRAO

8.4.1.1. RAW Repository Richard

A method to close the repository is provided in the proposal of a decommissioning method approved by SÚJB. 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 300 years after the operation is terminated. A monitoring program for a period after the closure has not yet been proposed.

8.4.1.2. RAW Repository Bratrství

A method to close the repository is provided in the proposal of a decommissioning method approved by SÚJB. 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 300 years after the operation is terminated. A monitoring program for a period after the closure has not yet been proposed.

8.4.2. RAW Repository Dukovany

A method to close the repository is provided in the proposal of a decommissioning method approved by SÚJB. Application of layers of sealing materials is anticipated to cover the repository. 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.

8.4.2.1. RAW Repository Hostim

Free space in the repository was sealed in 1997 (filled with concrete) to assure:

- access is prevented to the disposed RAW and the repository 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 repository surroundings.

9. TRANSBOUNDARY MOVEMENT – ARTICLE 27 OF THE JOINT

Several transboundary movements of SF and RAW occurred in 2005 – 2007.

In early December 2007 SF was transported from the research reactors in ÚJV Řež a. s. to the Russian Federation for reprocessing. Approximately 2 tons of SF was transported to the Russian Federation, containing 362 kg of uranium and plutonium, to be reprocessed in the “Mayak” reprocessing plant. The transport used a combination of road and railway transport means on the territories of the Czech Republic, Slovak Republic and Ukraine to the Russian Federation, in agreement with legislative requirements of all the countries affected by the transport. In the Czech Republic the requirements were represented by applicable SÚJB authorisations issued under the Atomic Act and relevant implementing decrees.

The transport was performed within the framework of initiative seeking to minimize threat of misuse of nuclear materials for terrorist purposes (Global Threat Reduction Initiative - GTRI), as a part of the program focusing on returning of fuel from research reactors back to the Russian Federation (RRRFR). The program is a three-party initiative of the USA, Russian Federation and IAEA.

SF was transported in 16 ŠKODA VPVR/M casks casks for transport and storage (manufactured by ŠKODA JS a. s. in the Czech Republic) and selected in 2005 in an international IAEA tender for the RRRFR program. After the respective tests the casks were type-approved by SÚJB for transport and storage of SF and later they were licensed by the competent regulatory bodies in the Russian Federation (as the first foreign cask licensed in the Russian Federation) and in the transit countries, Slovakia and Ukraine, for railway, road, as well as river and sea transport. In the course of transport the ŠKODA VPVR/M casks were fixed in special 20- feet ISO containers.

In August and September 2007 there were three transports of solid burnable RAW from NPP Dukovany to the company Studsvik Nuclear AB, Nyköping, Sweden, in order to reduce the RAW volume by incineration. The total weight of the waste was ca. 16 tons, with the total activity of the transported waste 0.2 GBq. The transport was performed in special 20-feet ISO containers, using a combination of road and sea transport on the territory of the Czech Republic and Germany to Sweden. The transport was performed in agreement with legislative requirements of all the countries affected by the transport and in agreement with the Council Directive 92/3/Euratom of February 3, 1992, on the supervision and control of shipments of RAW between Member States and in and out of the Community. In the Czech Republic SÚJB issued an applicable resolution based on the Atomic Act and on the implementing decree No. 317/2002 Coll.; the resolution was conditional upon the approval granted by competent bodies in the Federal Republic of Germany and Sweden.

SÚJB paid the utmost attention to the international transports of SF and RAW and SF transport was also monitored by SÚJB inspectors. The findings have shown that all organizations involved in the movements fulfilled their obligations. It has been concluded that no violations of requirements for nuclear safety, physical protection, radiation protection and emergency preparedness were found in the course of any of the transports.

The import of RAW is prohibited by Section 5 paragraph 3 of the Atomic Act:

„An import of radioactive waste into the territory of the Czech Republic, with the exception of the re-import of ionizing radiation sources produced in the Czech Republic or radioactive waste originated from materials exported from the Czech Republic for the purpose of their processing or reprocessing having been approved by the Office, is prohibited.”

International transport of RAW RAW (i.e. only its transit or export) is subject to a license by SÚJB under Section 9 paragraph 1 letters m) and p) of the Atomic Act and the method of transport is governed by provisions of Section 7 through 10 Decree No. 317/2002 Coll., on type-approval of packages for transport, storage and disposal of nuclear materials and radioactive substances, on type-approval of ionizing radiation sources and transport of nuclear materials and specified radioactive substances (on type-approval and transport). Provisions of Sections 8 and 9 Decree No. 317/2002 Coll. establish requirements for transport of radioactive materials in general and are fully compatible with requirements of Council Directive:

- 94/55/EC of November 21, 1994 on the approximation of the laws of the Member States with regard to the transport of dangerous goods by roads amended by Commission Directive 2001/7/EC of January 19, 2001 adapting for the third time to technical progress Council Directive 94/55/EC on the approximation of the laws of the Member States with regard to the transport of dangerous goods by road,

- 96/49/ECof July 23, 1996 on the approximation of the laws of the Member States with regard to the transport of dangerous goods by rail as amended by Commission Directive 2001/6/EC of January 29, 2001 adapting for the third time to technical progress Council Directive 96/49/EC on the approximation of the laws of the Member States with regard to the transport of dangerous goods by rail.

Provisions of Section 10 concern only international transport of RAW and are fully compatible with:

- Council Directive 92/3/Euratom of February 3, 1992 on the supervisions and control of shipments of RAW between Member States and into and out of the Community,

- Commission Decision of October 1, 1993 establishing the standard document for the supervision and control of shipments of RAW referred to in Council Directive 92/3/Euratom.

10. DISUSED SEALED SOURCES – ARTICLE 28 OF THE JOINT

Section 18 paragraph 1 letter c) of the Atomic Act establishes the obligation to keep and archive records on ionizing radiation sources, facilities, materials, activities, quantities and parameters and other facts important from the viewpoint of nuclear safety, radiation protection, physical protection and emergency preparedness and to hand over the recorded data to SÚJB as laid down in an implementing regulation.

The same Act in Section 22 letter e) requires to maintain and to keep records about ionizing radiation sources and to communicate the recorded information to the Office as laid down in an implementing regulation.

The implementing regulation, Decree No. 307/2002 Coll. as amended by 499/2005 Coll., in Section 80 paragraphs 1 and 2 requires also the following documents and data about the ionizing radiation sources.

The data under Section 80, paragraphs 1 and 2 of Decree No. 307/2002 Coll. as amended by 499/2005 Coll. shall be retained for at least 10 years after the termination of the ionizing radiation source management.

Licensees holding a license to use or store ionizing radiation sources shall send to the Office inwritten or another agreed form, to the state system of accounting for ionizing radiation sources the data on ionizing radiation sources they possess, except insignificant type-approved minor sources, unless the license condition 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 repository. 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 repository. Recommendations have been developed by SÚJB to handle disused sealed sources, which define the role of the Czech Police, Czech Customs Service and SÚRAO in the process and the duty of persons who find such a source to report the finding to SÚJB. According to Section 26, paragraph 3, letter k) of the Atomic Act, the found sources shall be administered by SÚRAO. Provided the owner of a found source 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 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 repository, separate premises in the repository have been dedicated for this type of sources, in the

form defined in the acceptance conditions for their storage. Among other conditions, the cask of such sources shall be leak-tight and easy to handle throughout the storage time.

Table 10.1 Number and radioactivity of disused sealed sources stored in RAW repository Richard

Radionuclide	**Number of sources [pcs]**	**Total activity [GBq]**
^{137}Cs	38	$4,45.10^{5}$
^{60}Co	53	$2,56.10^{5}$
^{238}U	2	$9,54.10^{-1}$
^{226}Ra	1	$3,66.10^{-1}$
^{238}Pu	6	$1,10.10^{2}$
^{239}Pu	41	$2,94.10^{3}$
^{241}Am	252	$4,54.10^{5}$
Total	**393**	**$7,09E.10^{5}$**

Table 10.2 Number and radioactivity of disused sealed sources disposed in RAW

Radionuclide	**Number of sources [pcs]**	**Total activity [GBq]**
^{90}Sr	313	$2,61.10^{3}$
^{147}Pm	35	$7,82.10^{1}$
^{85}Kr	113	$1,32.10^{3}$
^{3}H	10	$3,70.10^{3}$
^{55}Fe	46	$1,54.10^{2}$
^{137}Cs	573	$3,38.10^{5}$
^{60}Co	1494	$3,31.10^{5}$
^{252}Cf	16	$6,69.10^{0}$
^{239}Pu	42	$1,21.10^{3}$
^{241}Am	193	$7,50.10^{3}$
^{14}C	15	$1,43.10^{1}$
Total	**2850**	**$6,86.10^{5}$**

The Czech legislation enables reimportation of a sealed source by its manufacturer as specified in Section 5 paragraph 3 of the Atomic Act: *„An import of radioactive waste into the territory of the Czech Republic, with the exception of the re-import of ionizing radiation sources produced in the Czech Republic or radioactive waste originated from materials exported from the Czech Republic for the purpose of their processing or reprocessing having been approved by the Office, is prohibited."*

Table 10.3 Number and radioactivity of disused sealed sources disposed in RAW repository Bratrství

Radionuclide	Number of sources [pcs]	Total activity [GBq]
^{210}Pb	7	$8{,}72.10^{-1}$
^{226}Ra	188	$6{,}00.10^{1}$
Total	**195**	$\mathbf{6{,}09.10^{1}}$

11. PLANNED ACTIVITIES TO IMPROVE SAFETY

11.1. Nuclear Power Plant Dukovany

Treatment of radioactive sludge and ion exchangers has been tested in a pilot plant using immobilization in the so-called SIAL® matrix. At present, equipment and premises are being prepared to utilize the technology to treat sludge and ion exchangers. An application is being prepared to extend the license for RAW management to include the mentioned technology.

A waste crusher and equipment for removal of cable insulation are being commissioned to minimize the volume of solid RAW.

11.2. Nuclear Power Plant Temelín

A new treatment of radioactive sludge and ion exchangers has been implemented in a pilot plant using immobilization in the so-called SIAL® matrix.. Acceptability of the resulting product for RAW repository Dukovany has been verified by an independent analysis. The waste acceptance criteria have been met.

11.2.1. ÚJV Řež a. s.

ÚJV Řež a. s. has facilities that were in the past used for RAW management and some of them are no more in operation. The facilities are part of old environmental liabilities and have been gradually liquidated (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 earlier. They are the following facilities:

- building 211/6 – Reloading center for RAW,
- building 241 – Velké zbytky (RAW management facility), containing technology for processing of RAW,

- storage area for RAW Červená skála,
- building 211/5 – Decay tanks for RAW.

11.3. SÚRAO

11.3.1. RAW Repository Richard

Based on results of the pilot project for chamber closing using the principle of the so-called hydraulic cage, the proposed concept has been optimized and it is now being gradually applied for the released premise.

11.3.2. RAW Repository Bratrství

Based on the license issued by SÚJB for operation of the RAW Repository Bratrství a project has been under way to fill our free space in a selected chamber.

11.3.3. RAW Repository Dukovany

Research activities have been under way concerning further specification of radionuclides behavior in a nearby field (migration parameters), properties of sealing and backfilling materials in respect to the chemistry in the repository premises and host environment.

11.3.4. RAW Repository Hostim

No further activities are foreseen.

12. APPENDICES

12.1. List of SF Management Facilities

Table 12.1 List of SF Management Facilities

12.2 List of RAW Management Facilities

Facility	**Facility name**	**Storage capacity** [pieces FA]	**Storage capacity** [tons of heavy metal]
Dukovany	SF pool reactor unit1	699	83
	SF pool reactor unit2	699	83
	SF pool reactor unit3	699	83
	SF pool reactor unit4	699	83
	Interim Spent Fuel Storage Facility	5 040	600
	Spent Fuel Storage Facility	11 172	1340

Temelín	SF pool reactor unit1	703	396
	SF pool reactor unit2	703	396
Řež	Annex to HLW Storage Facility	360	
	SF pool in HLW Storage Facility	465	
	Wet tank	60	
	RAW storage facility	80	

12.2. List of RAW Management Facilities

Table 12.2 List of RAW Management Facilities

Licensee for RAW Management	Facility	Storage/Disposal capacity
EDU	**Storage of liquid RAW**	
	– RAW concentrate tanks	4500 m^3
	– Storage tanks for active sorbents	460 m^3
	Collection, storage and processing of solid RAW	
	– Sorting workplace and storage of solid RAW	1000 t
ETE	**Storage and processing of liquid RAW**	
	– Storage tanks for active sorbents	200 m^3
	– Storage tanks for radioactive concentrate	520 m^3
	Collection, storage and processing of solid RAW	
	– Sorting workplace and storage of solid RAW	856 m^3
SÚRAO	**Repository Richard***	8 300 m^3
	Repository Bratrství**	1 200 m^3
	Repository Dukovany	55 000 m^3
	Repository Hostim	1 690 m^3
ÚJV Řež a. s.	**Velké zbytky**	
	– Storage facility for liquid RAW	163 m^3
	– Storage facility for solid RAW	49 m^3
	High-level waste storage facility	300 m^3
	Storage area Červená skála	198 m^3
	Reloading site for RAW	1400 m^3

Notes:

* - total space mined out about 17 050 m3

** - total space mined out about 3 500 m3

12.3. List of Nuclear Installations in the Decommissioning Stage

At present, there are no NIs or other facilities associated with SF management on the Czech Republic’s territory in the stage of decommissioning. The school reactor ŠR–0 with a zero output, situated in Pilsen –Vochov, was decommissioned by decontamination and dismounting in 1995–1997. The workplace ceased to exist in 1997.

12.4. SF Inventory

Table 12.3 SF inventory as on 31 December 2007

Facility	Facility name	Storage capacity [pieces FA]	Storage capacity [tons of heavy metal]
Dukovany	SF pool reactor unit1	536	64
	SF pool reactor unit2	643	77
	SF pool reactor unit3	586	70
	SF pool reactor unit4	607	73
	CASTOR-440/84M cask at the service area in HVB 1	84	10
	Interim Spent Fuel Storage Facility	5 040	600
	Spent fuel storage facility	252	19
Temelín	SF pool reactor unit1	255*	123
	SF pool reactor unit2	168**	81
Řež	SF pool in HLW Storage Facility	0	0
	Wet tank	32***	
	RAW Storage Facility	0****	

Notes:

* – + 13 leaking fuel rods

** – + 18 leaking fuel rods

*** – fuel type IRT–2M, 36 % wt. ^{235}U

**** – the dry channels of the RAW Storage Facility are used to store 12 pieces of experimental irradiated rods from natural U (1 pc) and U enriched to 6.5 % wt. ^{235}U (11 pcs.)

12.5. RAW Inventory

Table 12.4 Inventory of solid low- and intermediate-level waste as on 31 December 2007

Licensee for RAW Management	Facility	Storage/Disposal capacity
EDU	Storage of liquid RAW	1793 m^3
	Storage for degraded sorbents	318 m^3
	Collection, storage and processing of solid RAW	507 t
ETE	Processing of liquid RAW	309 m^3
	Collection, storage and processing of solid RAW	119 t

SÚRAO	Repository Richard	7300 m^3
	Repository Bratrství	993 m^3
	Repository Dukovany	5930 m^3
	Repository Hostim	330 m^3
ÚJV Řež a. s.	Velké zbytky	49 m^3
	Storage area Červená skála	198 m^3
	HLW storage facility	5,2 m^3
	Reloading site for RAW	590 m^3

More details are provided in chapter 4.2.

12.6. Overview of the Czech Legislation

12.6.1 Overview of Legislation on Utilization of Nuclear Energy and Ionizing Radiation and Related Regulations

The following paragraphs contain an overview of valid legal regulations concerning nuclear energy and ionizing radiation.

12.6.1.1. Atomic Act and its Implementing Regulations

12.6.1.1.1. Atomic Act and Related Acts

- Act No. 18/1997 Coll., on peaceful utilization of nuclear energy and ionizing radiation and on amendments to and alterations of some acts,

- 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 amended 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. 83/1998 Coll., amending and altering Act No. 50/1976 Coll., on land planning and building regulations (Building Act), as amended later, and on amendments to and alterations of some other acts (Art. VI change of Section 6 of the Atomic Act),

- Act No. 71/2000 Coll., amending Act No. 22/1997 Coll., on technical requirements for products and on amendments to and alterations of some other acts (Art. X –change and modification of Section 23 of the Atomic Act),

- Act No. 132/2000 Coll., on modification and revocation of some acts related to the Act on Regions, Act on Municipalities, Act on District Offices and Act on the capital of Prague (Art. XX.– cancellation of Part II of Atomic Act – effective since 1 January 2001),

- 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 Act No. 50/1976 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. 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,

- Act No. 320/2002 Coll., altering and revoking some acts in connection with the terminated activities of district offices (Part 111, Article CXI, altering and amending Act No. 18/1997 Coll., as amended later).

12.6.1.1.2. SÚJB Decrees

- Decree No. 317/2002 Coll., on type-approval of packagings for transport, storage and disposal of nuclear materials and radioactive substances, on type-approval of ionizing radiation sources and transport of nuclear materials and specified radioactive substances (on type approval and transport), replacing and cancelling Decree No. 142/1997 Coll. and Decree No. 143/1997 Coll.,

- Decree No. 144/1997 Coll., on physical protection of nuclear materials and nuclear installations and their classification, as amended by Decree No. 500/2005 Coll.,

- Decree No. 145/1997 Coll., on accounting for and control of nuclear materials and their detailed specification, as amended by Decree No. 316/2002 Coll.,

- Decree No. 146/1997 Coll., specifying activities directly affecting nuclear safety and activities especially important from radiation protection viewpoint, on requirements for qualification and professional training, on methods for verification of special professional competence and issue of authorizations to selected personnel, and the form of documentation to be approved for licensing of training of selected personnel, as amended by Decree No. 315/2002 Coll.,

- Decree No. 179/2002 Coll., establishing a list of selected items and items of dual use in the nuclear area, replacing and cancelling Decree No. 147/1997 Coll.,

- Decree No. 307/2002 Coll., on radiation protection, as amended by Decree No. 499/20058 Coll., replacing and cancelling Decree No. 184/1997 Coll.

- Decree No. 132/2008 Coll., on quality assurance in activities associated with nuclear energy use and radiation practices and on establishing criteria for classification and categorization of selected equipment into safety classes, replacing and cancelling Decree No. 214/1997. Coll.

- Decree No. 215/1997 Coll., on criteria for siting of nuclear installations and very significant sources of ionizing radiation,

- Decree No. 318/2002 Coll., on details for assurance of emergency preparedness at nuclear installations and workplaces with sources of ionizing radiation and on requirements for the content of on-site emergency plans and of emergency rules , as amended by Decree No. 2/2004 Coll., replacing and cancelling Decree No 219/1997 Coll.,

- Decree No. 106/1998 Coll., on nuclear safety assurance of nuclear installations during their commissioning and operation,

- Decree No. 195/1999 Coll., on requirements for nuclear installations to assure nuclear safety, radiation protection and emergency preparedness,

- Decree No. 185/2003 Coll., on decommissioning of nuclear installations and workplaces in categories III or IV,

- Decree No. 324/1999 Coll., establishing concentration and quantity limits of nuclear materials not subject to provisions about nuclear damages,

- Decree No. 319/2002 Coll., on function and organization of the radiation monitoring network, as amended by Decree No. 27/2006 Coll.,

- Decree No. 419/2002 Coll., on personal radiation passes,

- Decree No. 193/2005 Coll., on establishment of a list of theoretical and practical fields, which form the content of education and training required in the Czech Republic to perform regulated activities within the competence of the State Office for Nuclear Safety,

- Decree No. 309/2005 Coll., on assurance of technical safety of selected equipment,

- Decree No. 462/2005 Coll., on distribution and collection of detectors for identification of buildings with a higher level of exposure from natural radionuclides and establishment of conditions for subsidies from the state budget.

12.6.1.1.3. Other Regulations

- Government Order No. 46/2005 Coll., amending Government Order No. 416/2002 Coll., establishing amounts of allocations and method of their payment by generators of radioactive waste to the nuclear account and amounts of annual contributions to municipalities and rules for their provision,

- Decree No. 360/2002 Coll., issued by the Ministry of the Industry and Trade, establishing a method to create a financial reserve for decommissioning of nuclear installations or workplaces in categories III or IV,

- Statute of the Radioactive Waste Repository Authority approved by the Government Resolution No. 846/2007,

- Government Order No. 11/1999 Coll., on emergency planning zone.

12.6.1.2. Related Regulations

- Communication No. 67/1998 Coll., on agreement to the Nuclear Safety Convention,

- Act No. 500/2004 Coll., on administrative procedure (Rules of Administrative Procedure),

- Act No. 44/1988 Coll., on protection and utilization of mineral riches (Mining Act),

- Act No. 552/1991 Coll., on state inspection, 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. 140/1961 Coll., Criminal Act (as enacted and amended later),
- Act No. 17/1992 Coll., on the environment,
- Act No. 244/1992 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. 187/1994 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)
- Act No. 123/1998 Coll., on the right for information about the environment, as amended later,
- Decree No. 220/1998 Coll., on method and scope of assessment of compliance of food, method of preparation and collection of samples from food and tobacco products by the producer, on food types requiring a written declaration of compliance to be issued by the producer or importer and on the scope and content of the declaration (assessment of compliance), as amended later,
- Act No. 106/1999 Coll., on free access to information, as amended by Decree No. 61/2006 Coll.,
- 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,
- Decree No. 321/1999 Coll., issued by the Ministry of the Industry and Trade to alter the Decree No. 560/1991 Coll., issued by the Federal Ministry of Foreign Trade, on the conditions to issue official permits to import and export goods and services, as amended later,
- Government Order No. 1/2000 Coll., on railway shipping rules for public railway freight transport, as amended later (particularly Section 14 thereof),
- Act No. 123/2000 Coll., on medical means and alterations in some related acts.(Sections 7, 23, 24, 28 and 38),
- 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., 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,

- Decree No. 225/2000 Coll., issued by the Ministry of Transport and Communications, specifying conditions of basic postal services and basic quality requirements of their assurance by the postal service licensee (Decree on basic services provided by postal services licensees) - Section 3,

- Act No. 244/2000 Coll., amending Act No. 91/1996 Coll., on animal food (Section 3 paragraph 13),

- Decree No. 350/2000 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. 37/2001 Coll., on hygienic requirements for products which come to direct contact with water and on water treatment (Section 3),

- Decree No. 89/2001 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,

- Government Order No. 181/2001 Coll., establishing technical requirements for medical means, as amended later (Government Order No. 336/2001 Coll.),

- 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.

12.6.1.3. Emergency Legislation

- Constitutional Act No. 110/1998 Coll., on Czech Republic's security, 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,

- Government Order No. 246/1998 Coll., defining lists of confidential facts, as amended later,

- Act No. 353/1999 Coll., on prevention of serious accidents caused by selected dangerous chemical materials and chemical preparations and on alteration of Act No. 425/1990 Coll., on district offices, regulation of their competence and other related provisions, as amended later (Act on Prevention of Serious Accidents),

- Act No. 239/2000 Coll., on integrated rescue system and alterations of some acts, as amended later,

- Act No. 240/2000 Coll., on crisis management and alterations of some acts (Crisis Act), as amended later,

- Act No. 241/2000 Coll., on Economic Measures. for Crisis Situations and on amendments to some other acts,

- Decree No. 328/2001 Coll., issued by the Ministry of Interior, on some details of integrated rescue system assurance, as amended, in the wording of the Decree 429/2003 Coll.

- Decree No. 380/2002 Coll., issued by the Ministry of Interior, on preparation and implementation of tasks in population protection.

12.7. Overview of National and International Safety Documents

An overview of safety documents relating to NPP Dukovany, NPP Temelin, reactor LVR-15 and all individual installations falling under the regime of the Joint Convention is provided in the Czech Republic National Report under the Joint Convention, Revision 2.3 of September 2005.

Other documents concern the following installations for management of spent fuel and radioactive waste:

- RAW Repository Dukovany
  - Safety Report for RAW repository Dukovany, update for the licensing procedure, SÚRAO, Prague, October 2007

- HLW Storage Facility
  - Team of Authors (2006): Proposed Method for Decommissioning of the HLW Storage Facility (Building211/8), Reg. No. DPP 300.11, Syst. No. 28.00.00, Edition No. 2, Revision No. 0, Level II, ÚJV Řež a. s., of 15 September 2006,
  - Team of Authors (2006): Quality Assurance Program, Commissioning of the HLW Storage Facility after its Refurbishment, Reg. No. PZJ 300.10, Syst. No. 40.00.00, Edition No. 1, Revision No. 1, Level II, ÚJV Řež a. s., of 1 December 2006,
  - Team of Authors (2006): Internal Emergency Plan for Operation of the HLW Storage Facility, Reg. No. DPP 300.27, Syst. No. 28.00.00, Edition No. 4, Revision No. 0, Level II, ÚJV Řež a. s., of 1 December 2006,
  - Team of Authors (2006): Limits and Conditions for Operation of the HLW Storage Facility (Building 211/8) in the Period of Hot Chamber Operation HK EK-10, Reg. No. DPP 300.24, Syst. No. 28.00.00, Edition No. 7, Revision No. 0, Level II, ÚJV Řež a. s., of 1 December 2006,
  - Team of Authors (2006): Monitoring Program for Operation of the HLW Storage Facility, Reg. No. DPP 300.26, Syst. No. 28.00.00, Edition No. 6, Revision No. 0, Level II, ÚJV Řež a. s., of 30 November 2006,

- Team of Authors (2006): Definition of the Controlled Area for Operation of the HLW Storage Facility, Reg. No. DPP 300.25, Syst. No. 28.00.00, Edition No. 6, Revision No. 0, Level II, ÚJV Řež a. s., of 1 December 2006,

- Team of Authors (2006): List of Selected Equipment, Implementation of Refurbishment of the HLW Storage Facility – Building 211/8, Class No. 4.4.2/315, Edition No. 1, Revision No. 2, ÚJV Řež a. s., of 19 December 2006,

- Team of Authors (2006): Operating Inspection Program for the HLW Storage Facility (Building 211/8), Reg. No. DPP 300.31, Syst. No. 28.00.00, Edition No. 1, Revision No. 0, Level III, ÚJV Řež a. s., of 1 December 2006,

- Team of Authors (2006): Quality Assurance Program, Commissioning of the HLW Storage Facility after its Refurbishment, Reg. No. PZJ 300.10, Syst. No. 40.00.00, Edition No. 1, Revision No. 1, Level II, ÚJV Řež a. s., of 1 December 2006.

• RAW repository Bratrství

- Feasibility study of technical alternative solutions for the RAW Repository Bratrství, stage I, IPRON Inženýring s.r.o., Prague, January 2004,

- Feasibility study of technical alternative solutions for the RAW Repository Bratrství, stage II, IPRON Inženýring s.r.o., Prague, March 2005,

- Technical solution of Chamber No. 2 Reconstruction in the RAW Repository Bratrství, IPRON Inženýring s.r.o., Prague, February 2007,

- Technical solution of Chamber No. 2 Reconstruction in the RAW Repository Bratrství, Amendment to the KDE determination, IPRON Inženýring s.r.o., Prague, May 2007.

12.8. Overview of Final Reports by International Assessment Missions

An overview of reports from international assessment missions which took place in the period from the 2004 until the end of 2007:

- WATRP Review Report on the Czech Deep Geological Repository Dvelopmnet Programme Convened by the IAEA, 2004 (SÚRAO)

- WANO Peer Review, 2007 (NPP Dukovany),

- WANO Peer review mission, 2004 (NPP Temelin)

- WANO mission, 2004 (NPP Temelin),

- Follow-up WANO Peer Review, 2006 (NPP Temelin).

12.9. Other – Uranium Industry in the Czech Republic

12.9.1. Powers and Responsibilities of State Administration Bodies

Materials generated by mining activities and subsequently also materials and activities relating to closing of uranium (as well as ore and coal) mining facilities administered by the state enterprise DIAMO are regulated by legislative documents issued by MPO. The powers and responsibilities of state administration bodies have been assigned as follows:

- SÚJB, as a state administration body responsible under Section 3, paragraph. 2, letters b), d), o) and other of the Atomic Act and under Section 9, paragraph 1, letter l) of the same Act, issues its resolutions concerning :
  - management of nuclear materials, in respect to:
    - the category – natural uranium in form of uranium concentrate,
    - the quantity in tons,
    - the permitted method of use, e.g. purchase, sale and storage.
  - management of sources of ionizing radiation (execution of services to ensure monitoring under the monitoring program),
  - definition of controlled areas – dumping areas for radioactive material (e.g. uranium concentrate),
  - approval to decommission tailing ponds, workplaces with very significant sources of ionizing radiation, their decommissioning with dismounting and removal of structures (i.e. removal of free water from the tailing pond, liquidation of the facility consisting in extraction and removal of sediments, land reclamation etc.).

SÚJB, as a state administration body responsible under Section 3, paragraph 2, letters d), o) and others of the Atomic Act also approves:

  - classification of transported nuclear materials into the respective category from the viewpoint of physical protection,
  - method of physical protection assurance during transport of nuclear materials (chemical concentrate of uranium).

- The locally competent water right authority issues under Section § 104 of the Act No. 254/2001 Coll., as amended later, resolutions – permissions to discharge wastewater, hutch water and other waters into public watercourses,
- The building department of the respective municipal (or higher) authority) and the building department for the uranium industry issues e.g. certificates of final completion for facilities (and their liquidation) within implementation of the program to close mining facilities administered by the state enterprise DIAMO,

- The body in charge of public health protection – the respective (regional) hygienic officer, in agreement with the governmental order No. 361/2007 Coll., establishing conditions of health protection at work, issues resolutions concerning e.g. definition of high-risk workplaces,

- Relevant territorial departments of the Ministry of Agriculture, as the body in charge of state administration of forests under Section 14, paragraphs 1 and 2 of the Act No. 289/1995 Coll., as amended later, issues approvals with plans to reclaim land plots which should perform the function of a forest, e.g. during liquidation of chemical extraction of uranium in Stráž pod Ralskem.

12.9.2. Inventory

The state enterprise DIAMO Stráž pod Ralskem, as a representative of the uranium industry in the Czech Republic, deposits materials resulting from mining and treatment of uranium ore, which contain natural radionuclides or are contaminated by them, in the mining location on pits and in tailing ponds. The activity is performed based on the Act No. 61/1988 Coll., on mining activities, explosives and state mining administration, as amended, and based on the Act No. 44/1988 Coll., on protection and utilization of mineral riches (Mining Act), as amended.

Establishing and operation of pits and tailing ponds and management of materials containing radionuclides or contaminated by them shall be considered mining activities under Section 2 of the Act No. 61/1988 Coll.. The term mining activity also includes directly related activities and all materials resulting from such activity shall be defined as materials from mining activities. In agreement with the Czech legislation the activity shall be viewed as management of materials resulting from mining activities and not from management of RAW.

Materials resulting from mining activities may be classified into two groups:

- materials produced directly as a result of mining and treatment of uranium ore and treatment of mining water, i.e. waste rock, sludge from treatment of uranium ore and sludge from treatment of hutch water,

- materials contaminated with radionuclides, as a result of the contact during mining, transport and treatment of uranium ore, i.e. contaminated process equipment, contaminated building structures, contaminated working clothes, aids etc.

A pit is an earthwork developed by systematic deposition of waste rock (from an underground mine or treatment plant) on a designated pit area, which is a part of the auxiliary operations zone of the mining facility.

A tailing pond is a natural or man-made area on the earth surface, serving for permanent or temporary storage of mostly liquid sludge (slime and process leftovers from ore treatment); the tailing pond includes a system of dikes and each tailing pond is viewed as a hydroengineering structure.

Pits and tailing ponds relating to mining activities and containing minerals are also viewed as mineral deposits under Section 4 of the Mining Act.

The state enterprise DIAMO administers pits and tailing ponds in the mining locations listed below.

12.9.2.1. Closed mining district Stráž pod Ralskem

- Pits of the Hamr I mine – operation closed, a part of the site has been reclaimed and redeveloped
- Tailing pond of the chemical treatment plant Stráž (stage I and II) – operation closed, redevelopment works have been under way on the site

12.9.2.2. Operating mining district Dolní Rožínka

- Pit of the Rožná I mine – in operation; it is used to deposit waste rock from mining of uranium and other minerals
- Pits of uranium mines in the Moravian district – operation closed, most of them have been reclaimed and redeveloped
- Tailing pond of the chemical treatment plant Rožná – K I is in operation; it is used for sludge from uranium ore treatment and other materials from mining activities. Tailing pond Zlatkov – K II has been used for other (non-uranium related) activities

12.9.2.3. Closed mining and treatment districts Příbram, West Bohemia and

Mydlovary

- Pits of the uranium mines in Příbram – operation closed, the materials have been processed into crushed aggregate. Some of the pits have been removed, reclaimed and redeveloped,
- Tailing pond of the treatment plant in Dubno – K I is in operation to deposit sludge from treatment and washing of crushed aggregate. The tailing pond K II has been closed and partly reclaimed,
- Pits and tailing ponds of uranium mines in West Bohemia, including old loads – operation closed, selected pits have been used to produce crushed aggregate, and others have been reclaimed and redeveloped. Old loads include pits and tailing ponds of the former mine in Jáchymov with insufficient redevelopment measures,
- Tailing pond of the chemical treatment plant in Mydlovary – operation closed; extensive reclamation and redevelopment works have been under way on the site.

12.9.3. Human and Financial Resources

In order to ensure radiation protection and safety during management of materials from mining activities (mining and processing of uranium ore), which contain radionuclides or are contaminated by them, the state enterprise DIAMO has an adequate number of professionally qualified personnel and technical equipment at the appropriate technical level.

In order to improve radiation protection and safety during management of materials from mining activities the enterprise has implemented a certified quality management system under ČSN EN ISO 9001:2001.

Financial resources necessary to meet the statutory requirements relating to nuclear safety and radiation protection in the process of gradual closing of uranium mines and elimination of impacts of such activities are guaranteed by the state budget approved by the Czech government for each respective year.

12.9.4. Existing Facilities and Practices Used in the Past

The existing facilities for disposal of materials from mining activities, containing radionuclides or contaminated by them, are pits and tailing ponds administered by the state enterprise DIAMO.

The pits were usually established in a close proximity of underground mines and they are mostly made or of waste rock from uranium extraction. Tailing ponds were developed close to chemical treatment plants for uranium ore and they were used to deposit slime and process leftovers from uranium ore processing. Apart from the mentioned materials, the pits and tailing ponds were during mining used to deposit other materials from mining activities, which contained radionuclides or were contaminated by them. Before decommissioning, particularly the tailing ponds are used to deposit materials resulting from decommissioning of mines, treatment plants and related operations and also sludge from treatment of hutch water. In addition to affecting the original character of landscape and occupation of farm or forest land, the most significant risks of operating pits and tailing ponds include potential emissions into the atmosphere and contamination of underground water. The quality of atmosphere was adversely affected by high dust levels, particular on windy days from dry beaches of the tailing ponds. Apart from fine particles of the deposited material, the atmosphere was also contaminated with particles containing e.g. aluminum-sulfate and calcium-sulfate salts or uranium and radium. Underground water is usually contaminated with seepage from pits and particularly from tailing ponds, which had been in the past often developed without a sufficient insulation from the permeable subsoil. The seepage process water and atmospheric water contain uranium, radium, heavy metals, flotation agents and other chemical and dissolved substances, depending on the composition of extracted and treated ores, which in combination with underground water usually adversely affect their quality.

At present, the only pits and tailing ponds in operation for uranium extraction are those on the Rožná site in Dolní Rožínka. The operated facilities for deposition of materials from mining activities fully comply with requirements set in applicable regulations and their safety and radiation protection meet the common international standards. Other pits and tailing ponds administered by the state enterprise DIAMO have been closed due to the terminated mining activities and reclamation and redevelopment works have been under way.

12.9.5. Siting of Proposed Facilities

Apart from the existing operated or liquidated and reclaimed repository sites for materials from mining activities (pits and tailing ponds), the state enterprise DIAMO has not proposed or planned development of any new ones.

12.9.6. Design and Construction of Facilities

The existing pits and tailing ponds were designed, established and developed in agreement with valid regulations and standards (Mining Act, Building Act, Water Act, hygienic standards, standards dealing with heath protection against ionizing radiation and other standards) in 1950 through 1980. The designing works were performed mainly by the specialized Design Institute for the Uranium Industry and the construction itself was performed by special-purpose building contractors for the uranium industry.

12.9.7. Assessment of Safety of Facilities

Before their commissioning the pits and tailing ponds went through a standard process of evaluation, approval and certification of final completion, with the involvement of applicable authorities of state administration and state professional supervision. Safety of the facilities was assessed during the mentioned approval process and commissioning, as in effect in that particular time.

12.9.8. Operation of Facilities

Operation of the pits and tailing ponds is subject to applicable generally binding legal regulations. Operation of the pits and tailing ponds is only possible if approved by and under conditions specified in resolutions issued by the respective authorities of state administration and state professional supervision. The operation shall be managed by professionally qualified personnel, in agreement with specified regulations and operating and manipulation rules of the equipment. Proper operation of the facility shall include as its integral part technical and safety supervision and monitoring of the working environment and surrounding environment, including monitoring of values, parameters and facts important form the viewpoint of radiation protection.

12.9.9. Basic Measures after Closure

Measures after decommissioning of pits and tailing ponds for deposition of materials from mining activities containing radionuclides and contaminated by them are addressed in detail in the technical design for liquidation of each respective facility. One of the fundamental criteria of the measures after decommissioning is to ensure adequate nuclear safety and radiation protection of persons and the environment. The design for the liquidation is assessed, reviewed and approved before its implementation with the involvement of authorities of state administration and state professional supervision. The approval process also includes a resolution by SÚJB about the decommissioning and evaluation of environmental impacts.

Pits are usually completely or partly removed or reshaped in agreement with the surrounding terrain and subsequently technically and biologically reclaimed. Redevelopment measures for tailing ponds focus primarily on stabilization of the dike system, removal of a potentially present water lagoon and filling of the free space, with subsequent technical and biological reclamation. Limitation of ionizing radiation from the deposited material containing radionuclides or contaminated by them is performed within the reclamation measures by coverage with a suitable inert material. Limits and conditions of safe operation are determined by the respective state administration authority, in agreement with generally binding legal regulations.

In the course of implementation of reclamation measures monitoring is performed of the working environment and surrounding environment, including monitoring of values, parameters and facts important form the viewpoint of radiation protection. After completion of reclamation works long-term monitoring is performed in agreement with a program approved by the state professional supervision authority, in order to verify effectiveness of the implemented measures.

12.9.9.1. Planned Activities to Improve Safety

In order to increase radiation protection and safety of management of materials from mining activities containing radionuclides or contaminated by them the state enterprise DIAMO has planned to intensify the integrated management system through continual improvement of the implemented quality management system under ČSN EN ISO 9001:2001.

The planned technical measures to increase safety and radiation protection include development of process equipment for reprocessing of the so-called balance sludge from hutch water.

Another measure which intensifies radiation protection and safety during elimination of impacts of mining activities is the application of a statutory process of the environmental impact analysis, which also applies to pits and tailing ponds.