Czech Republic

National Report

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

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Revision 2.3

September 2005

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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 of some acts as enacted later
BAPP	auxiliary service building for primary systems (NPP Dukovany)
BPP	auxiliary building (NPP Temelín)
ČR	Czech Republic
ČSKAE	Czechoslovak Atomic Energy Commission
DGR	deep geological repository
EDU	ČEZ, a. s., Nuclear Power Plant Dukovany
EOAR	equivalent volume activity of radon
ERC	Emergency Response Center
ETE	ČEZ, a. s., Nuclear Power Plant Temelín
EU	European Union
FA	fuel assembly
FDS	fragmentation and decontamination center
FJFI	Faculty of nuclear and physical engineering, Czech Technical University in Prague
FNM ČR	National Property Fund of the Czech Republic
HLW	high level waste
HM	heavy metal
HSP	ČEZ, a. s., Central Office Prague
HVB	main production building
I.O.	primary circuit
II.O.	secondary circuit
IAEA	International Atomic Energy Agency
ICRP	International Committee for Radiation Protection
INES	International Nuclear Event Scale
IRRT	International Regulatory Review Team
IRS	Incident Reporting System
ISFSF	Interim Spent Fuel Storage Facility
Joint Convention	the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
k_{eff}	effective neutron multiplication coefficient (ratio of the number of neutrons in the n^{th} and $(n-1)^{st}$ fission generation in the final environment)
LVR	light water reactor
MPO	Ministry of the Industry and Trade of the Czech Republic
MV	Ministry of the Interior of the Czech Republic
MŽP	Ministry of the Environment of the Czech Republic
National Report	National Report by the Czech Republic under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
NI	nuclear installation
NPP	Nuclear Power Plant
PE	polyethylene

Policy	Policy for radioactive wastes management and spent fuel management in the Czech Republic approved by the Czech Government's Resolution No. 487 of 15 May 2002
PZJ	quality assurance program
RAW	radioactive waste
RF	Russian Federation
SF	spent fuel
SFSF	Spent Fuel Storage Facility
SÚJB	State Office for Nuclear Safety (or Office)
SÚJCHBO	State Institute for Nuclear, Chemical and Biological Protection
SÚRAO	Radioactive Wastes Repository Authority (or Authority)
SÚRO	State Institute for Radiation Protection
SVO	special water purification system
ŠTK	transfer cask shaft (under ČEZ, a. s. terminology also shaft No. 1)
ÚJF Řež	Nuclear Physics Institute Řež
ÚJV Řež a. s.	Nuclear Research Institute Řež a. s.
ÚKŠ	Central Crisis Staff (or Staff)
ÚVVVR	Institute for Research, Production and Utilization of Radioisotopes, Prague
VVER	type identification of light water reactors designed in the former Soviet Union

Summary

On 25 March 1999 the Government of the Czech Republic approved the Joint Convention which came into effect in the Czech Republic on 18 June 2001. In agreement with the obligations resulting from its accession to the Joint Convention the Czech Republic has already drawn the second National Report for the purposes of Review Meetings of the Contracting Parties, which describes the system of spent fuel and radioactive waste management in the scope required by selected articles of the Joint Convention. The information contained in this report were gathered and updated as at 31 December 2004, unless stated otherwise. Meanwhile, at the national level the National Report serves as a source of up-to-date publicly available information (http://www.sujb.cz) on methods of spent fuel and radioactive waste management in all facilities subject to the Joint Convention.

Results from the First Review Meeting of the Contracting Parties to the Joint Convention in 2003 and the existing practices make it possible to conclude that spent fuel and radioactive waste management in the Czech Republic fully complies with the Joint Convention articles. The Atomic Act and its implementing decrees form a legislative base for all activities in spent fuel and radioactive waste management and clearly define responsibilities of license holders for the achieved level of nuclear safety, radiation protection, emergency preparedness and physical protection. Specific activities were completed and started before the end of 2004, which:

- have ensured and will ensure that long-term storage of spent fuel from all operated nuclear power plants on the Czech Republic's territory is performed, in agreement with the approved governmental Policy, in type-approved casks placed in dry spent fuel stores at the NPP Dukovany and NPP Temelín sites,
- will significantly improve nuclear safety and radiation protection in management of spent fuel from research reactors and in connection with these activities the spent fuel will be transported in 2006 or later to the Russian Federation under the international project "Russian Research Reactor Fuel Return" which is a part of the "Global Threat Reduction Initiative" supported by IAEA and by the US Government,
- are related to the ongoing safe storage and disposal of selected categories of operating and institutional low-level and intermediate-level radioactive wastes in near-surface repositories operated by the state organization SÚRAO, established by MPO to provide for activities associated with disposal of radioactive wastes.

The following activities, which have been planned for 2005 – 2010 to improve the safety of spent fuel and radioactive waste management, should be mentioned:

- 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. The technologies will ensure safe disposal of all categories of operating low- and intermediate-level radioactive wastes which meet waste acceptance criteria for the Dukovany repository,
- continuation of the rehabilitation of environmental contamination at the site of ÚJV Řež a. s., including transport of spent fuel from research reactors to the Russian Federation,
- projects of closing of selected disposal chambers in the Richard and Bratrství repositories.

In the long-term prospective the key activity foreseen in spent fuel and radioactive waste management will be development of a national deep geological repository which should start its operation after 2065.

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

1. Introduction

This report is the National Report submitted by the Czech Republic for the purposes of the Second Review Meeting of the Contracting Parties to the Joint Convention. Its objective is to describe the fulfillment status of obligations under the Joint Convention in the Czech Republic as at 31 December 2004. The outline of the National Report is based on recommendations approved at the Preparatory Meeting of the Contracting Parties to the Joint Convention held December 2001 and contained in the „Guidelines regarding the form and structure of national reports (INFCIRC/604)“ of 1 July 2002.

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

- ISFSF Dukovany – in commercial operation since 1997,
- RAW repository Dukovany – in commercial operation since 1995, owned by the state since 2000.

SFSF Dukovany, under construction since April 2004, will be after its completion and license issue another nuclear installation at the site (its commissioning is scheduled in the second half of 2006).

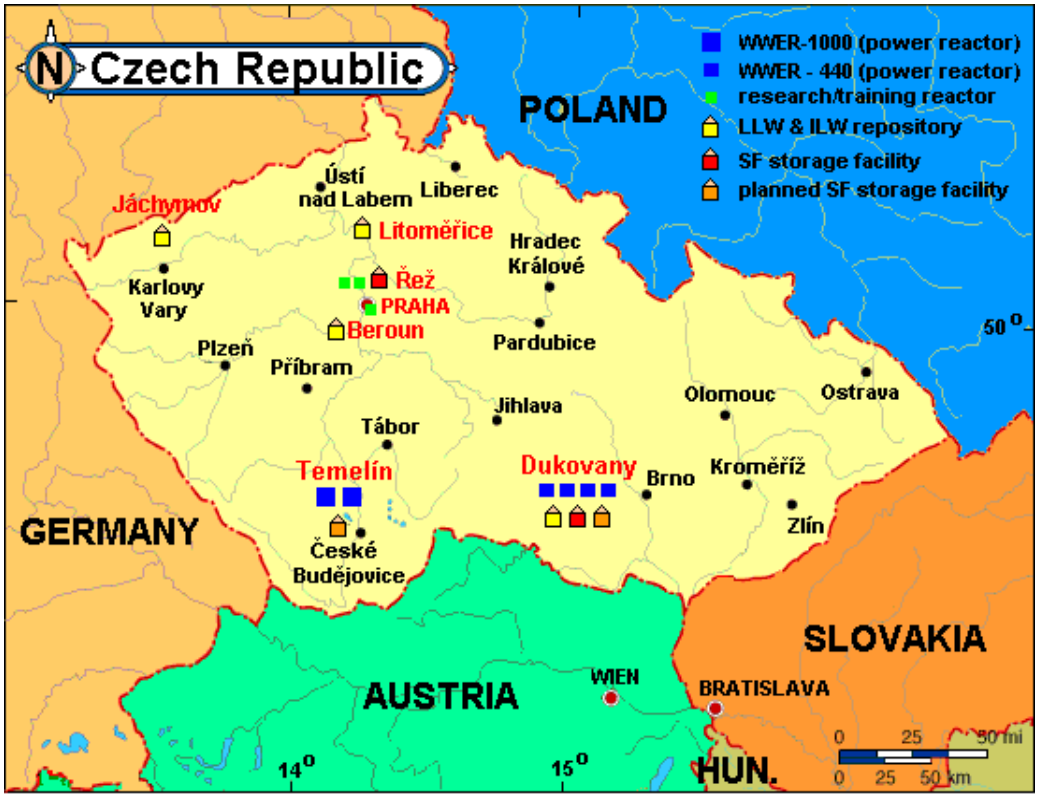

Fig. 1.1 Locations of selected nuclear installations and facilities subject to the Joint Convention in the Czech Republic

In addition to the separate nuclear installations the NPP Dukovany site also includes SF pools and ŠTK in each production unit to handle SF. Similar facilities - SF pools and ŠTK are also a part of NPP Temelín, which features two reactor units VVER 1000/320.

SF produced by operation of the research reactor LVR–15 in ÚJV Řež a. s. is stored in the HLW storage facility, which is in agreement with the Czech law classified as an independent nuclear installation. 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, which is used to dispose RAW from the operation of nuclear power plants, there are the following storage facilities on the Czech Republic's territory:

- RAW repository Hostím in Beroun (operated in 1959-1964; decommissioned in 1997),
- RAW repository Richard in Litoměřice (institutional waste; in operation since 1964),
- RAW repository Bratrství in Jáchymov (permanent disposal of wastes contaminated with natural radionuclides; in operation since 1974).

2. Categorization of RAW and Policy for Radioactive Waste Management and Spent Fuel Management – Art. 32 paragraph 1 of the Joint Convention

1. In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

(i) spent fuel management policy;
(ii) spent fuel management practices;
(iii) radioactive waste management policy;
(iv) radioactive waste management practices;
(v) criteria used to define and categorize radioactive waste.

2.1 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 agreement with Decree No. 307/2002 Coll., on radiation protection, RAW include gaseous, liquid and solid wastes. Solid RAW are divided into three basic categories - temporary, low- and intermediate- and high-level radioactive wastes:

- transient RAW are wastes whose radioactivity after long-term storage (up to 5 years) is lower than release levels,
- low- and intermediate-level RAW are divided into two sub-groups: short-lived, whose half-life of radionuclides (including ^{137}Cs) is shorter than 30 years and with limited mass activity of long-lived alpha sources (in an individual CASK up to 4000 kBq/kg and the mean value 400 kBq/kg in the total volume of waste produced in one calendar year), and long-lived which include other wastes than those in the short-lived RAW sub-group,
- for HLW their storage and disposal shall take into account release of heat from decay of radionuclides contained therein.

SF shall not be considered RAW under the Atomic Act unless its has been classified as RAW by its owner or by SÚJB. Storage of SF shall be subject to the same requirements as RAW before disposal and SF shall be stored in a manner that does not aggravate its further treatment.

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 contain exclusively natural radionuclides and they are not considered nuclear installations under the Atomic Act.

2.2 Policy for Radioactive Waste Management and Spent Fuel Management

The Policy, approved by the Czech Government on 15 May 2002 (Government Resolution No. 487/2002), is the fundamental document defining a strategy of the state and its agencies in RAW management (produced both by nuclear installations and workplaces with sources of ionizing radiation in healthcare, research and industry) by about 2025, with an outlook to the end of the 21st century, in respect to generators of RAW and SF. The Policy uses the following main principles:

- management of RAW and SF in the Czech Republic is provided for by authorized private entities and SÚRAO and, if needed, the SÚRAO will also provide extended services for the generators,
- liquidation of low- and intermediate-level short-lived RAW in the Czech Republic is performed by their safe disposal in the existing near-surface repositories whose operation has been continually evaluated and economically optimized,
- one of the options to liquidate low-and intermediate-level long-lived RAW which does not meet an acceptance criteria of existing repositories and HLW is their disposal in DGR; before the facility is put into operation these materials will be stored with their generators or in facilities of the SÚRAO,
- technology procedures for RAW management and preparation to implement DGR in the Czech Republic have been in agreement with the legislative requirements and results of foreign research and technology developments. Simultaneously, possibilities of SF reprocessing are monitored and assessed, as well as the use of new technologies leading to reduction of SF volume and toxicity,
- the costs of activities associated with disposal of RAW and SF are paid from the nuclear account, a financial source created by generators of RAW and SF in agreement with the Atomic Act and established government order, while the nuclear account as a part of the state financial assets and liabilities and is managed by the Ministry of Finance. This assures that the costs of disposal for wastes generated now will not be transferred to future generations,
- general public is kept informed about the Policy and about its fulfillment.

Management of RAW and SF, as described in the following chapters of this Report, is performed in agreement with the Policy. As at 31 December 2004 no major changes were made in the Policy which was described in detail in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1 of February 2003.

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

1. *This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.*

2. *This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.*

3. *This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defense programs, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defense programs if and when such materials are transferred permanently to and managed within exclusively civilian programs.*

4. *This Convention shall also apply to discharges as provided for in Articles 4, 7, 11, 14, 24 and 26.*

The Policy does not anticipate reprocessing of SF from operation of power generating reactors in the Czech Republic. The use of SF reprocessing is justifiable if its economic or safety benefits have been demonstrated. The existing prices in the preceding part of the fuel cycle, particularly prices of natural uranium, are currently making SF reprocessing economically disadvantageous. From the viewpoint of safety, reprocessing does not significantly increase radiation risks but from the viewpoint of disposal, reprocessing or treatment procedures for RAW from reprocessing, enable separation of long-lived and risky radionuclides and therefore also their optimum treatment before final disposal. On the other hand, the requirements for a deep repository design to accommodate HLW from SF reprocessing are more demanding than in case of direct disposal of SF.

Beyond the scope of requirements in Article 3 of the Joint Convention, the chapter 12.9 of the first National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1 of February 2003, provides basic information about residues after mining and treatment of uranium ores which contain natural radionuclides. Materials produced during the mining and treatment of uranium ores and not placed in repositories are concentrated in pits and tailing ponds. Due to the contained radioactive materials these facilities are subject to all applicable criteria for radiation protection. Their overview is provided an appendix section hereto.

Under the Atomic Act, nuclear energy may be in the Czech Republic used only for peaceful purposes and therefore the Czech Republic participates in no projects for military utilization of nuclear energy. For this reason the SF and RAW on the Czech Republic's territory comes exclusively from peaceful utilization of nuclear energy.

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

2. This report shall also include:

(i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;

(ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;

(iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;

(iv) an inventory of radioactive waste that is subject to this Convention that is being held in storage at radioactive waste management and nuclear fuel cycle facilities; has been disposed of; or has resulted from past practices. This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

(v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.

4.1 Inventory and Facilities for SF Management

This part of the National Report contains a list and brief descriptions of facilities used for SF management in nuclear power and research facilities. Along with the information provided in Chapter 7, this Chapter 4 contains details concerning the following SF management facilities:

- for the NPP Dukovany – SF pools and ISFSF Dukovany,
- for the NPP Temelín – SF pools,
- for the ÚJV Řež a. s. – wet accumulator tank for SF, SF storage facility and HLW storage facility.

4.1.1 Nuclear Power Plant Dukovany

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

4.1.1.1 SF Pools

To assure safe storage of SF removed from reactors, SF pool is provided next to each reactor unit, its volume being 335 m^3, and the SF is stored in it for a period of time required to reduce the residual heat output. After that period the thermal output and radiation of SF assemblies drops to

a level permitting their transport in CASTOR-440/84 type-approved casks for transport and storage in ISFSF Dukovany. The storage pools for SF assure the following functions:

- undercriticality of the stored SF,
- removal of residual heat from PS,
- protection against radioactive radiation.

In the pools the SF is stored in a compact grid with the capacity of 682 positions. SF Pools also contains 17 positions for hermetic cases to store damaged SF. Depending on the number of removed FA in the annual reactor campaign, the pools enable to store SF for a period of at least 7 years. Only in case of emergency removal of fuel from the core or during inspection of the reactor pressure vessel, a reserve grid is inserted into SF pool.

Fig. 4.1 Uncovered SF pool and ŠTK during reactor refueling

As at 31 December 2004 all four pools contained 2270 FAs with the total weight 488 050 kg, with the weight of heavy metals about 271 000 kg.

4.1.1.2 ISFSF Dukovany

ISFSF Dukovany, situated inside the NPP Dukovany site, is designed for dry storage of SF in CASTOR-440/84 casks. A central building of ISFSF Dukovany is a ground-level hall with a combined structural system, with fixed poles from reinforced concrete 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 mounted from panels made of reinforced concrete 100 mm thick. The storage part of the building is surrounded with a shielding concrete wall 5 m high and 500 mm thick. The floor is a slab of reinforced concrete with dust-free consolidating surface finish.

ISFSF Dukovany is an independently functioning unit linked by utility networks to the networks of NPP Dukovany. It has a railway siding and road links to the reactor units of NPP Dukovany.

The total capacity of ISFSF Dukovany is 60 casks, while on 31 December 2004 ISFSF Dukovany contained 54 CASTOR-440/84 casks and 1 filled casks was prepared in the reactor hall of unit 1 to be transported to the ISFSF. 4-5 containers are moved to ISFSF Dukovany every year.

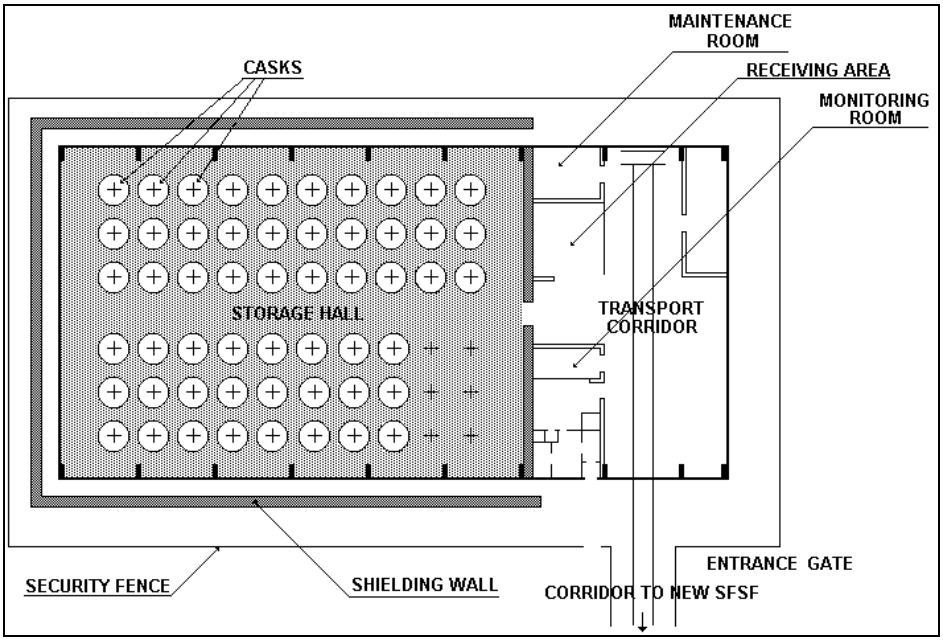

Fig. 4.2 Ground plan of ISFSF Dukovany

4.1.2 Nuclear Power Plant Temelín

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

4.1.2.1 SF Pools

Similarly as in NPP Dukovany, the main production building in NPP Temelín has a storage pool for SF removed from the reactor with the volume 1440 m^3, immediately next to the reactor well. The removed SF is stored here for a period of 12 years (in the course of NPP operation) or for at least 5 years (after NPP operation is closed) in a storage pool. SF pool is divided into 3 parts: two bigger parts have two grid sections each and the third has only one storage grid section.

Fig. 4.3 Uncovered SF pool at NPP Temelín

The entire SF pool enables to store 678 FAs, 25 FAs in hermetic cases and 2 cluster cases (one position is used now). In a standard storage regime, however, at least 163 positions shall remain free for potential emergency removal of assemblies from the entire reactor core.

As on 31 December 2004 SF pool of NPP Temelín in unit 1 contained 84 FAs and SF pool in unit 2 contained 42 FAs.

4.1.3 ÚJV Řež a. s.

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

4.1.3.1 SF Pool in the Reactor Hall

The SF pool is designed to store SF removed from the reactor core of LVR-15. It is an aluminum vessel in the floor of the reactor hall, protected with concrete on all sides and a steel-plated case. The vessel is covered with three cast iron plates 500 mm thick. The plates have two handling openings with lids. The upper edge of the reactor vessel is connected to the tank with a sloping pipe ending at the tank bottom. In 1996 the fuel was taken out from the wet accumulator tank and its condition inspected. The level and physical and chemical parameters of water in the tank are continually monitored.

As at 31 December 2004 the tank contained 30 FAs IRT-2M with the initial enrichment 36% wt. ^{235}U.

4.1.3.2 Building 211/7 – SF Storage Facility

The object includes two pools - A and B. The internal dimensions of pool A are 230 x 120 cm, depth 6 m and of pool B 440 x 120 cm, depth 6 m. The stated length includes a 50 cm long handling recess. The pools are built of heavy concrete cast between the inner and outer jacket of the stainless steel vessel. The pool walls and bottom are made of stainless steel inner jacket, 50 cm of heavy concrete and outer stainless steel jacket. No pipes pass through the walls or bottom. The pools are provided with a filtration equipment. Water for filtration and its recycling are conducted inside the pool. The pools do not have any discharge openings in the bottoms.

Racks made of aluminum alloy are placed on the pool bottom to store SF. To suspend experimental devices the pool walls are provided with holders ca. 30 cm below the upper edge. Dry channels are made of concrete, diameter 20 cm, and 5,5 m deep. The channels are drained to the active waste sewers. The object has a forced ventilation system with an outlet to the object roof. 3 USIT 1-2B measuring probes are installed in the object to measure dose rate of beta and gamma radiation of STADOS system, with the set up signal level 0,1 mSv/h. During SF handling the object is provided with a Kopr-type volume activity meter for alpha and beta aerosols in the air. The object is connected with the reactor hall via a gate and outhouse.

There is a railway track between the reactor hall and the object in which an electric track car transports casks with SF or radioactive parts of the experimental equipment with high dose rate.

The facility premises are used for temporary storage of activated probes, loops and other active material (pool B) and temporary storage of SF (pool A). Accessories of the pools include a water treatment circuit and a water pump with output 60 l/min. In addition to the pools the facility also features six dry stainless steel storage channels sunk in the floor. Shielding of the active equipment in the pools is provided with a layer of water and in dry channels with steel lids. Activated equipment from the reactor hall is transported in cask with a special self-propelled electric track car. The area is provided with a bridge crane with a crab. Shielded casks are used to transport SF and activated parts of probes and loops from the reactor into the wet accumulator tank and storage facility and to transport SF from the storage facility to the HLW storage facility (Building 211/8).

As at 31 December 2004 the facility contained 51 FAs IRT-2M with the initial enrichment 36% wt. ^{235}U and 12 FAs IRT-2M with the initial enrichment 80 % wt. ^{235}U (from which 2 were in hermetic cases).

4.1.3.3 Building 211/8 – HLW Storage Facility

The high-level waste storage facility is designed to store solid RAW and spent fuel produced in ÚJV Řež a. s. in the research reactor VVR–S or LVR–15, developed as a result of an extensive reconstruction of the original Soviet research reactor VVR–S, and at its research workplaces.

The facility was built in 1981 – 1988. Subsequently, modifications were made to meet SÚJB requirements. The facility construction was completed in 1995. Its trial operation started in 1995 and since 1997 the facility has been in permanent operation.

The building is a prefabricated hall, ca. 13 × 34 m and 15 m tall. The interior is made up of eight concrete boxes of square ground plan for dry storage of solid RAW and SF type EK–10 (used in the VVR–S reactor until 1975) and two cylindrical pools for wet storage of SF type IRT–M.

The SF EK–10 is stored in dry conditions, in drums backfilled with concrete. The pools consist of inner stainless steel vessel placed in another vessel of carbon steel embedded in concrete. The pool diameter is 4,6 m and water level 5 m. The storage capacity in the pool A is 300 FAs and in the pool B 465 FAs. The storage space in the boxes is horizontally divided with concrete panels into three levels. The upper cover is made of two shielding panels. The boxes dimensions are 5,75 x 5,75 m, 5 m tall.

The storage facility has a gate into the entrance hall adapted for transport means. The facility is also provided with an emergency exit at the hall's back part.

The facility also includes a station for demineralized water MIX 1000 to produce and maintain the required quality of shielding water in the pool, situated next to the entrance hall. The demi-water station area includes a storage tank for liquid RAW, which include particularly water from ion exchangers regeneration and rinse water. From here liquid RAW are pumped to a transport tank to be moved to Building 241 (RAW management facility Velké zbytky), where they are processed along with other liquid RAW.

Ventilation of the storage facility is provided with an air outlet without any air supply systems. Air outlet ventilators operate when the operating personnel is present in the object. An electric bridge crane is used for handling purposes, with the loading capacity 12,5 t. The facility is provided with a radiation monitoring system.

The HLW storage facility is provided with a signaling system responding to the following parameters:

- tightness of inner tanks with a system of capacity sensors detecting leakage of water from the pool,
- level meter for shielding water in the pool,
- level meter for liquid RAW in the storage well of the demi-water station,
- operation of ventilators,
- dose rate of the stable dosimetric system,
- radioactive aerosols in the air (in trial-operation in 2005),
- conductivity of shielding water in the SF pool, with an automatic startup of the demi-water station.

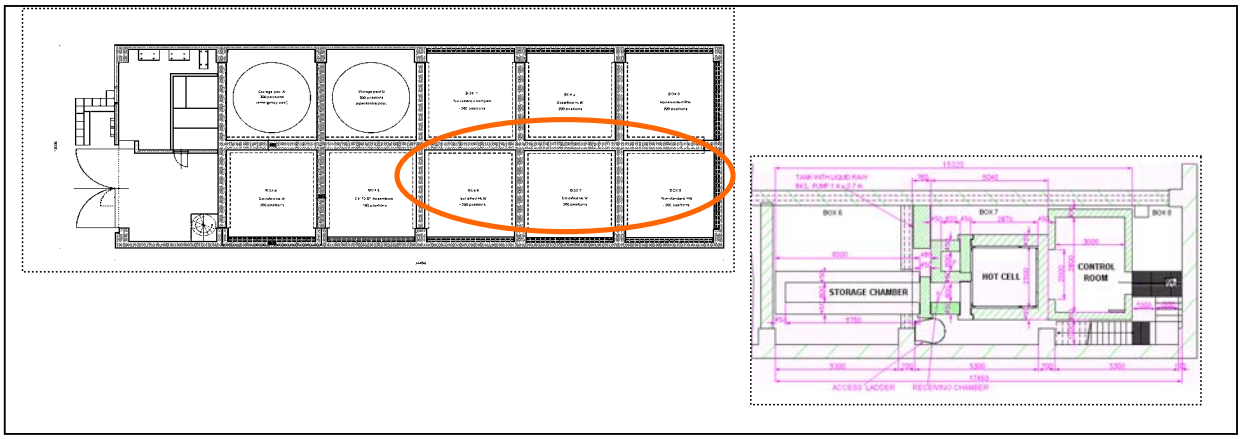

Fig. 4.4 Ground plan of the HLW storage facility

Light signaling of all these parameters is situated on a control panel in the storage hall. The signals are also run to the control panel in the building 241 and continually monitored. The facility is provided with an electronic security system.

The facility safety is assured with a multi-barrier system. The system consists of the inner and outer vessel, insulation of the boxes and the entire building. There is a drainage system under the building, connected to a tank with the volume of 6 m^3, from which water samples are collected on regular basis to determine the content of radionuclides. Samples are regularly collected from drill wells situated around the facility to determine the content of radionuclides.

As a part of rehabilitation efforts to remove old environmental liabilities, which involve liquidation of radioactive contamination and RAW and relocation of SF into the HLW storage facility, the HLW storage facility is being refurbished. On 9 April 2003 a contract was signed for rehabilitation works to redress environmental damage, between FNM ČR and ÚJV Řež a.s. SF management will be required particularly under the item No. 22 – relocation of fuel EK-10 into HLW storage facility and item No. 23 – relocation of fuel IRT-M into HLW storage facility.

The spent nuclear fuel of EK-10 type from operation of the research reactor in 1958 – 1975 was stored in 200 l drums backfilled with concrete in building 211/6 – Reloading center for RAW, which was not originally designed for SF storage. The transport to the building 211/6 occurred in 1969 – 1975. As the storage failed to provide sufficient radiation protection in the research institute and beyond, the EK-10 SF was transported in 200 l drums (190 of them) in 1996-1997 to the HLW storage facility.

The current condition of EK-10 SF in drums is unknown. The most critical aspect is that the storage containers are not hermetically sealed. The fact is associated with corrosion of fuel assembly cladding which may result in a release of radioactive materials outside the storage containers. Moreover, the storage containers may lose their integrity as a result of age and material used to manufacture them. Therefore the EK-10 fuel needs to be inserted into new hermetic cases. Re-packaging of the fuel from the existing 200 l drums into hermetic cases will take place in a hot cell developed, along with other necessary technology, in the HLW storage facility. Encased fuel will be placed in Škoda VPVR/M cask's baskets and subsequently placed in a storage installation (storage safe) adjoining on the hot cell. Construction works in the HLW storage were completed on 31 December 2004 and preparations have started to install operation technologies.

As at 31 December 2004 the pool B contained 256 FAs in total, from which 16 of EK-10 type (enrichment 10 % wt. ^{235}U) and 240 of IRT–2M type (enrichment 80 % wt. ^{235}U). The thermal power of the FAs was 569.54 W as at 18 August 2003. The total number of storage units containing EK-10 type fuel in the dry store in the HLW storage box No. V is 190.

4.2 Inventory and Facilities for RAW Management

4.2.1 Nuclear Power Plant Dukovany

The NPP Dukovany generates liquid, solid and gaseous RAW. Facilities for RAW management are listed by the individual types of radioactive wastes in the chapters below.

4.2.1.1 Solid RAW

4.2.1.1.1 Management of solid RAW

- Low-level RAW

  Management of low-level solid RAW consists of the following stages:

  – 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 metallic casks for minor metallic waste. Solid RAW with dose equivalent rate > 1mSv/h are stored 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 Petrůvky without requiring a permit to be issued by SÚJB,

  – 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 m^3 or, after low-pressure compacting (15 t) in 200 litters galvanized casks in BAPP storage vaults.

- Intermediate-level RAW (wastes that fail to meet criteria for disposal in RAW Repository, non-generating heat)

  RAW, that due to their high specific activity of radionuclides cannot be disposed in RAW repository are stored in an organized manner in storage premises for radioactive items and their final conditioning and disposal will be addressed within decommissioning of NPP.

4.2.1.1.2 Equipment for processing of solid RAW

- Low-level RAW

  Although the concept for management of solid RAW established in 1980s anticipated a wider range of technologies for solid RAW processing, at the moment only low-pressure compacting is available. Another technology to minimize the final volume of solid RAW was

high-pressure compacting in 1996 (using a rented high-pressure compactor). In early 2005 additional equipment was introduced to reduce the volume of solid RAW (waste crusher, cable insulation ripper).

- Intermediate-level RAW

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

4.2.1.1.3 Facility for storage of solid RAW

- Low-level solid RAW

  The system for storage of low-level solid RAW is situated in BAPP. It consists of 13 concrete pools sized 6 x 9 x 11 m. The pool floors are at the level - 1.3 m. The pool ceilings are covered at +10.80 m 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. Over the storage facility, at the level +10,80 m, there is a steel hall 9 x 60 x 8 m, which encloses the whole area over the pools. The hall has a 5 t crane and a grip to handle monolith panels, hermetic closures and to move box pallets with solid RAW into the pools. At present 8 pools are being used from the total number of 13 pools:

  – 4 pools in BAPP 108/2, 3, 4, 5 are equipped with built-in structures for palleting. The pools are used for storage of solid RAW in box pallets or in 200 l casks. Each pool is covered with 8 monolith panels. The structure inside divides each pool into 32 units (1 unit:1206 x 860 mm). Each unit accommodates 20 mutually fitting pallets stacked on one another,
  – 1 pool is designed to store spent air-conditioning filters. The pool is divided into 48 units, each with a built-in steel structure 600 x 600 mm. Each unit is covered with a hermetic closure,
  – 3 pools are kept as a reserve to store solid non-standard RAW, that are difficult to process to fit into a box pallet. Each pool 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

4.2.1.2.1 Facility for conditioning of liquid RAW

Liquid RAW generated in the process of cleaning and treatment of liquid radioactive media are collected and subsequently stored in BAPP in storage tanks with the volume of 460 or 550 m^3.

Further processing of radioactive concentrates into a form acceptable for RAW Repository Dukovany is performed with bituminization technology. Bitumen-based product is than disposed in 200 l galvanized casks in RAW Repository Dukovany. At the moment, no treatment of radioactive sludge and ion exchangers is performed.

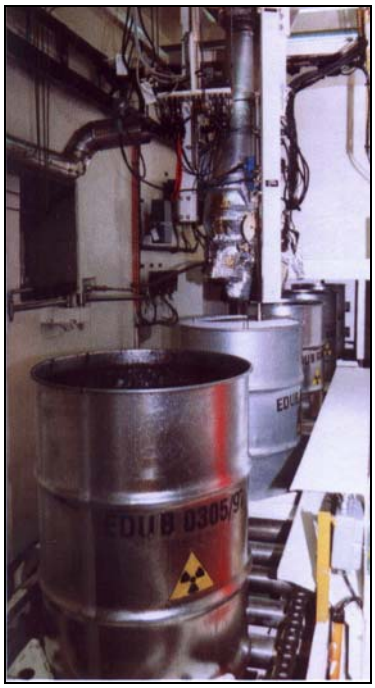

Fig. 4.5 View of a bituminization line to process liquid RAW

4.2.1.2.2 Facilities to store liquid RAW

The system for storage of liquid RAW consists of:

- storage tanks for radioactive concentrate with the total volume 2680 m^3 (4x550+460m^3) per a double reactor unit,
- emergency tanks for radioactive concentrate with the volume of 460 m^3,
- tanks for active sorbents with the volume of 460 m^3 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.

Tab. 4.1 Comparison of the actually stored RAW with the limits and conditions for storage as at 31 December 2004

Waste type	The maximum permitted quantity to be stored	The actually stored quantity
liquid RAW – concentrates of active waters	4500 m^3	2424 m^3
liquid RAW – spent ion exchangers	460 m^3	303 m^3
solid RAW total	1000 t	495 t
Treated RAW in casks stored in buildings 809 PS–48 ZRAW	500 drums	22 drums

4.2.1.3 Gaseous RAW

4.2.1.3.1 Equipment to collect gaseous RAW

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

4.2.1.3.2 Equipment for treatment of gaseous RAW

Gaseous RAW are processed by the technological systems for venting and ventilation - gaseous RAW are either treated or held-up. The treatment includes filtration of radioactive aerosols, including radioactive iodine in aerosol form. The hold-up means the gas flow is slowed down and the activity of short-lived radionuclides drops. The processing of gaseous RAW results in solid RAW and a gaseous medium meeting requirements for discharge into the environment.

Tab 4.2. Activity of gaseous effluences

		Year				
Radionuclide	**Activity A effective dose E Use of annual limit L**	**2000**	**2001**	**2002**	**2003**	**2004**
$^{89+90}$Sr	A [Bq]	$1.196 . 10^{5}$	$3.786 . 10^{5}$	$1.124 . 10^{5}$	$1.101 . 10^{5}$	$3.605 . 10^{4}$
	E [Sv]	$1.3 . 10^{-12}$	$1.45 . 10^{-11}$	$9 . 10^{-13}$	$8 . 10^{-13}$	$7 . 10^{-13}$
	L [%]	$3.3 . 10^{-6}$	$3.6 . 10^{-5}$	$2.3 . 10^{-6}$	$2 . 10^{-6}$	$1.7 . 10^{-6}$
Ra-iodine (^{131}I)	A [Bq]	$1.547 . 10^{8}$	$1.58 . 10^{7}$	$1.063 . 10^{7}$	$1.078 . 10^{7}$	$1.564 . 10^{7}$
	E [Sv]	$2.073 . 10^{-10}$	$2.12 . 10^{-11}$	$1.42 . 10^{-11}$	$1.44 . 10^{-11}$	$2.1 . 10^{-11}$
	L [%]	$5.2 . 10^{-4}$	$5.3 . 10^{-5}$	$3.56 . 10^{-5}$	$3.61 . 10^{-5}$	$5.24 . 10^{-5}$
Ra-noble gases	A [Bq]	$9.87 . 10^{12}$	$3.67 . 10^{12}$	$3.608 . 10^{12}$	$3.551 . 10^{12}$	$6.662 . 10^{12}$
	E [Sv]	$2.55 . 10^{-8}$	$6.2732 . 10^{-9}$	$6.231 . 10^{-9}$	$6.926 . 10^{-9}$	$1.182 . 10^{-8}$
	L [%]	$6.387 . 10^{-2}$	$1.568 . 10^{-2}$	$1.558 . 10^{-2}$	$1.731 . 10^{-2}$	$2.955 . 10^{-2}$
Ra-aerosols	A [Bq]	$6.38 . 10^{7}$	$7.42 . 10^{7}$	$5.53 . 10^{7}$	$2.241. 10^{8}$	$4.811 . 10^{7}$
	E [Sv]	$2.55 . 10^{-8}$	$6.2732 . 10^{-9}$	$3.7377 . 10^{-9}$	$1.343 . 10^{-8}$	$3.277 . 10^{-9}$
	L [%]	$1.057 . 10^{-2}$	$1.335 . 10^{-2}$	$9.344 . 10^{-3}$	$3.375 . 10^{-2}$	$8.194 . 10^{-3}$
Tritium (^{3} H)	A [Bq]	$2.455 . 10^{11}$	$1.862 . 10^{11}$	$9.26 . 10^{10}$	$8.508 . 10^{11}$	$8.135 . 10^{11}$
	E [Sv]	$1.276 . 10^{-10}$	$9.68 . 10^{-11}$	$4.82 . 10^{-11}$	$4.424 . 10^{-10}$	$4.23 . 10^{-10}$
	L [%]	$3.19 . 10^{-4}$	$2.42 . 10^{-4}$	$1.20 4 . 10^{-5}$	$1.106 . 10^{-3}$	$1.057 . 10^{-3}$
^{14}C	A [Bq]	$3.409 . 10^{11}$	$3.186 . 10^{11}$	$3.659 . 10^{11}$	$5.917 . 10^{11}$	$8.0376 . 10^{11}$
	E [Sv]	$6.58 . 10^{-8}$	$6.15 . 10^{-8}$	$7.06 . 10^{-8}$	$1.142 . 10^{-7}$	$1.551 . 10^{-7}$
	L [%]	0.1645	0.1537	0.1765	0.2855	0.3878
Transuranium elements	A [Bq]	$2.05.10^{4}$	$1.76 . 10^{4}$	$3.26 . 10^{4}$	$3.2 . 10^{3}$	$7.78 . 10^{3}$
	E [Sv]	0.00	0.00	0.000	0.0	0.0
	L [%)	0.00	0.00	0.000	0.0	0.0
TOTAL	**D [Sv]**	**$9.591 . 10^{-8}$**	**$7.324 . 10^{-8}$**	**$8.0653 . 10^{-8}$**	**$1.3501 . 10^{-7}$**	**$1.7067 . 10^{-7}$**
TOTAL+H.O.	**D [Sv]**	**$9.591 . 10^{-8}$**	**$7.324 . 10^{-8}$**	**$8.0653 . 10^{-8}$**	**$1.3501 . 10^{-7}$**	**$1.7067 . 10^{-7}$**
TOTAL	**L [%]**	**0.2398**	**0.1831**	**0.2016**	**0.3375**	**0.4267**
Air	[mil.m^{3}]	9703	10108	9807	10092	10576

4.2.2 Nuclear Power Plant Temelín

The operation of NPP Temelín produces liquid, solid and gaseous RAW.

- Liquid radioactive media are processed in special treatment stations so that the treated water may be used again in the plant and separated radioactive materials may be processed and disposed. Liquid concentrates and spent ion exchangers are temporarily stored in the tanks of the radioactive concentrates storage facility and from there transported for bitumenization in BPP. The operation of the plant by the end of 2004 had produced 940.6 m^3 of radioactive concentrate in total. From this volume 569.1 m^3 have been processed on the bitumenization line.
- Solid RAW are stored in storage facilities for solid RAW.
- The philosophy for gaseous RAW processing is fairly simple: separation of radioactive materials from contaminated gasses by filtration.

4.2.2.1 Solid RAW

Tab. 4.3 Solid RAW produced from the beginning of operation to 31 December 2004

Year	Total	Low-pressure compacting	
	[t]	[t]	[m^3]
2000	**-**	**-**	**-**
2001	0.5	-	-
2002	21.3	0.5	1.2
2003	100.6	10.6	24.4
2004	106.7	12.7	38.8
TOTAL	**229.1**	**23.8**	**64.4**

Note:
Data in the column „Total [t]" include all solid RAW with the dose rate > 1 μGy/hour. This waste is sorted as follows:
- non-active (discharged into the environment)
- radioactive (low-pressure compacting into 200 l casks, stored in BAPP)

4.2.2.2 Gaseous RAW

The following tables list activities of gaseous effluences, effective doses caused by them to an individual from a critical group of population and contributions of individual radionuclide groups to the drawing on the established limit for gaseous effluences, for the period from 1 January 2003 to 31 December 2004:

Tab. 4.4 Activity of gaseous effluences

Radionuclide	Activity/ Effective dose	Year	
		2003	2004
$^{89+90}$Sr	A [kBq]	0.00	0.00
	E [μSv]	0.00	0.00
RI	A [MBq]	3.8138	122.7381
	E [μSv]	0.00	0.0001
Noble gases	A [GBq]	34382.97	6484.5967
	E [μSv]	0.1317	0.0295
Aerosols	A [kBq]	374365.3	27931.4021
	E [μSv]	0.1294	0.0003
Tritium	A [GBq]	325.5978	1299.2604
	E [μSv]	0.0016	0.0066
^{14}C	A [GBq]	334.6364	409.4883
	E [μSv]	0.6191	0.7578
Transuranium elements	A [kBq]	46.7782	47.3519
	E [μSv]	0.0004	0.0004
TOTAL	**D [μSv]**	**0.8822**	**0.7945**
TOTAL+II.O.	**D [μSv]**	**0.8822**	**0.7945**
Air	[mil.m^3]	1 265.527	5734.9561

Tab. 4.5 Contributions by individual radionuclide groups to drawing on limits for total annual effluences

Radionuclide	Year	
	2003	2004
$^{89+90}$Sr	0.0000 %	0.0000 %
RI	0.0000 %	0.0003 %
Noble gases	0.3293 %	0.0738 %
Aerosols	0.3235 %	0.0008 %
Tritium	0.0042%	0.0185 %
^{14}C	1.5477 %	1.8939 %
Transuranium elements	0.0010 %	0.0010
TOTAL	**2.2055%**	**1.9862 %**
TOTAL+II.O.	**2.2055 %**	**1.9862 %**

The established limit is an authorized limit for the effective dose from external exposure and effective dose load for an individual from the critical group of population, as established for ETE by SÚJB at 40 μSv/year. The limit is based on the optimized limit set in Section 56 of Decree No. 307/2002 Coll. (200 μSv for gaseous effluences for nuclear power installations).

4.2.3 SÚRAO

4.2.3.1 RAW Repository Richard

The repository is used to dispose of particularly RAW containing artificial radionuclides. Separately from the disposed RAW there are also RAW, which cannot be currently disposed and wait to be disposed in a respective repository. They are mainly spent sealed radionuclide sources, collected sources used in smoke detectors and nuclear materials.

Tab. 4.6 Inventory of RAW disposed in the Richard repository as at 31 December 2004

Radionuclide	**Total activity** [Bq]
^{3}H	$5.31 . 10^{13}$
^{14}C	$8.19 . 10^{12}$
^{36}Cl	$8.89 . 10^{9}$
^{90}Sr	$2.77 . 10^{13}$
^{99}Tc	$4.31 . 10^{7}$
^{129}I	$4.83 . 10^{6}$
^{137}Cs	$5.41 . 10^{14}$
Total activity of long-lived α radionuclides	$1.57.10^{13}$

Tab. 4.7 Inventory of radioactive wastes stored in RAW Repository Richard as at 31 December 2004

Radionuclide	**Total activity** [Bq]
^{137}Cs	$2.44 . 10^{14}$
^{60}Co	$4.01 . 10^{14}$
^{147}Pm	$1.32 . 10^{05}$
^{241}Am	$3.13 . 10^{12}$
^{239}Pu	$2.14 . 10^{12}$
^{238}Pu	$1.11 . 10^{11}$
^{238}U	$9.57 . 10^{08}$
^{226}Ra	$3.65 . 10^{08}$
^{235}U	$4.00 . 10^{05}$
Total activity of long-lived α radionuclides	$5.38 . 10^{12}$

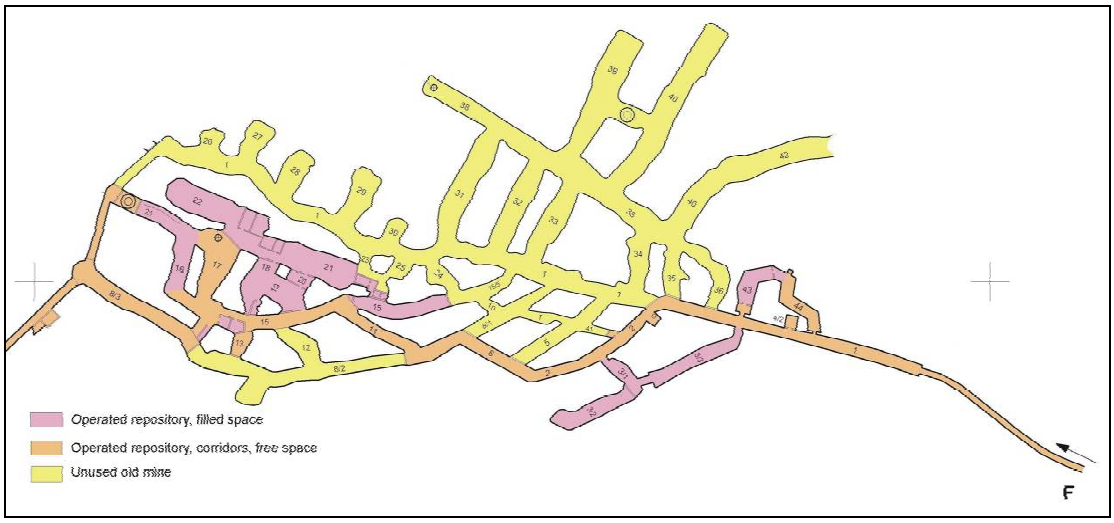

Fig. 4.6 RAW Repository Richard – cross section

4.2.3.2 Repository Bratrství

The repository is used to dispose of RAW containing natural radionuclides.

Tab. 4.8 Inventory of the repository Bratrství as at 31 December 2004

Radionuclide	**Total activity** [Bq]
^{226}Ra	$1.262 \cdot 10^{12}$ Bq
U	$3.426 \cdot 10^{11}$ Bq
^{232}Th	$1.178 \cdot 10^{8}$ Bq

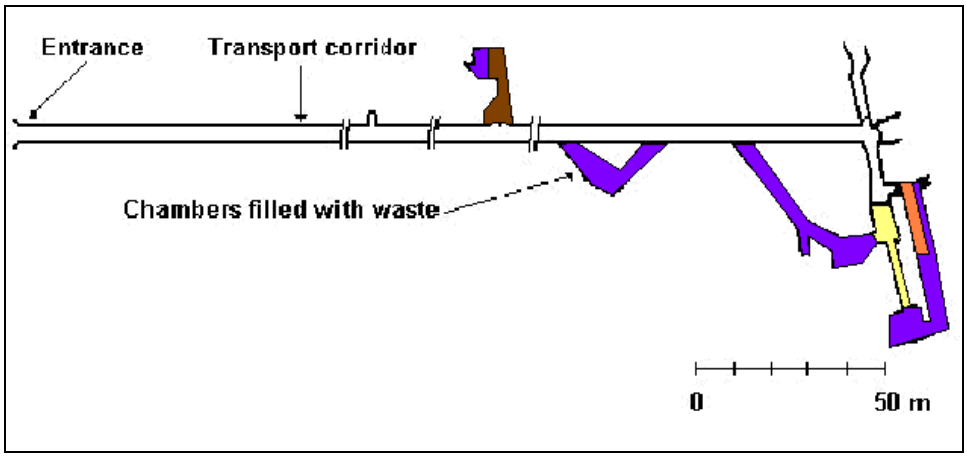

Fig. 4.7 Repository Bratrství – cross-section

4.2.3.3 RAW Repository Dukovany

The repository is used to dispose of short-lived and low-level RAW from both the nuclear power plants on the Czech Republic's territory.

Tab. 4.9 Inventory of the Dukovany repository as at 31 December 2004

Radionuclide	Total activity [Bq]	Radionuclide	Total activity [Bq]
^{14}C	$3.10 \cdot 10^{10}$	^{99}Tc	$1.23 \cdot 10^{9}$
^{41}Ca	$2.07 \cdot 10^{8}$	^{129}I	$5.38 \cdot 10^{8}$
^{59}Ni	$1.57 \cdot 10^{9}$	^{137}Cs	$5.02 \cdot 10^{11}$
^{63}Ni	$7.35 \cdot 10^{10}$	^{239}Pu	$2.88 \cdot 10^{6}$
^{90}Sr	$3.02 \cdot 10^{9}$	^{241}Am	$1.51 \cdot 10^{8}$
^{94}Nb	$9.17 \cdot 10^{8}$		

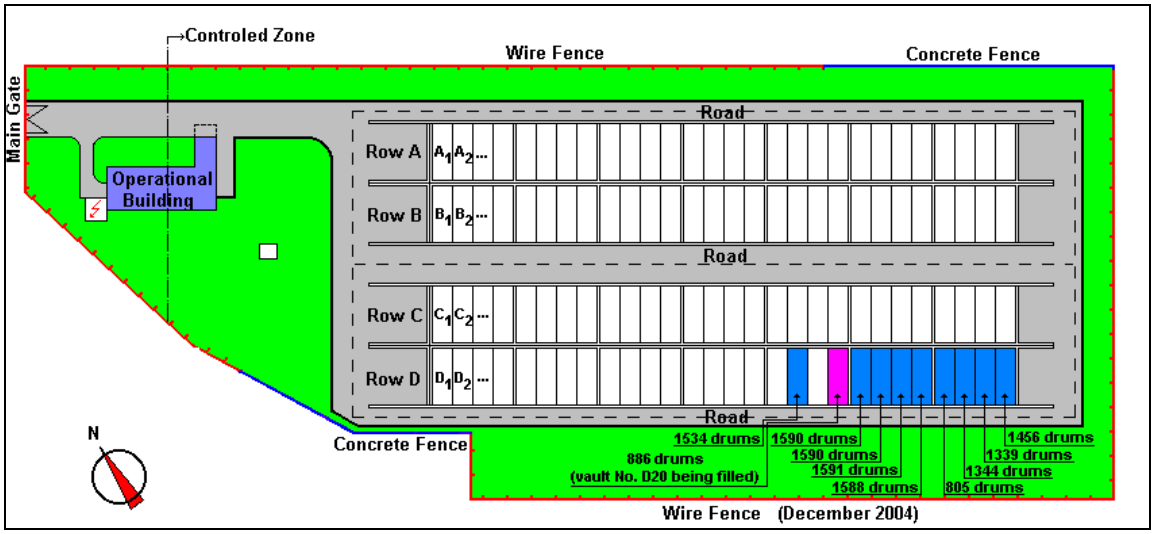

Fig. 4.8 Ground plan and current filling status in the tanks in RAW Repository Dukovany as at 31 December 2004

4.2.3.4 RAW Repository Hostím

The repository was used to dispose RAW of institutional origin and has been closed. Based on a conservative evaluation of documents and radiation monitoring the activity of its inventory was calculated as in 1991, which is provided in tab. 4.10.

Tab. 4.10 Inventory of the Hostím repository – activity recalculated as in 1991

Radionuclide	**Total activity** [Bq]	
	gallery A	**Gallery B**
^{3}H	Estimate: equivalent of gallery A, max. 10^{10} Bq (the range of radionuclides produced in the then 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 of long-lived α radionuclides *)	max. 10^{10}	ca. 10^{11}
Total activity of short-lived α radionuclides **)	$< 10^{11}$	

*) recalculated as in 1997
**) recalculated as in 2002

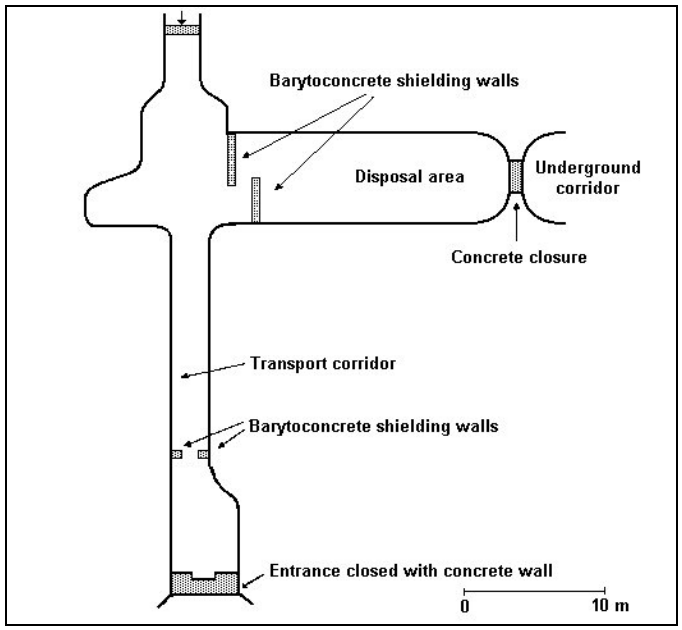

Fig. 4.9 RAW Repository Hostím – cross section

4.2.4 ÚJV Řež a. s.

4.2.4.1 Building 241 – Velké zbytky - RAW Management Facility

The facility is used to store RAW before treatment and RAW after conditioning before the transport for disposal.

Tab. 4.11 Quantities of low- and intermediate-level RAW before processing

Volume of liquid RAW [m^3]	**Volume of solid RAW** [m^3]
163	23

Tab. 4.12 Quantities of conditioned low- and intermediate-level RAW

Maximum volume of RAW [m^3]
26

Tab. 4.13 Quantities of low- and intermediate-level solid RAW stored in Building 211/6

Box No.	**Volume of RAW** [m^3]
box No. 1	140
box No. 2	140
box No. 3	100
box No. 4	140
box No. 7	20
box No. 8	50
Total	**590**

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

4.2.4.2 Building 211/8 – HLW Storage Facility

Tab. 4.14 Quantity of low-and intermediate-level RAW

Box No.	**Volume of RAW** [m^3]
box No. I	0.02
box No. II	2.4
box No. IV	2.8
Total	**5.22**

The estimated total activity of the stored RAW is 1,87 MBq (isotopes $^{235, 238}U$), 30.29 GBq (^{239}Pu), 7.7 TBq (activation products, particularly ^{60}Co).

Tab. 4.15 List of the stored SF

SF	No. [pcs.]	Placement	Estimated activity	Prevailing radionuclides
IRT–2M (80 % wt. ^{235}U)	240	Pool B	2872 TBq	U isotopes, fission products, actinides
EK–10 (10 % wt. ^{235}U)	16	Pool B	80 TBq	
EK–10 (10 % wt. ^{235}U)	190	Concrete OS	950 TBq	

4.2.4.3 Storage Area for RAW Červená skála

Tab. 4.16 Quantities of low- and intermediate-level RAW

Placement	Number [pieces]	Volume of RAW [m^3]
ISO containers	6	120
Collecting tanks in building 261	2	20
Sand filter tanks in building 241	5	20
Collecting tanks 9A, 9B, 9C in building 241	3	30
Exchangers in building 241	2	4
Tanks B a C in building 241	2	4
Total	**20**	**198**

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

4.2.4.4 Decay Tank for RAW, Building 211/5

Tab. 4.17 Quantities of RAW stored in decay tanks

Placement	Volume of RAW [m^3]	
	Liquid RAW	**Solid RAW**
Pool A	4.5	0
Pool B	8	3
Total	**12.5**	**3**

The estimated activity of the stored RAW in decay tanks, building 211/5 is 50,2 TBq.
The prevailing radionuclides are ^{60}Co, fission products (particularly ^{90}Sr, ^{137}Cs).

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

5.1 Implementing Measures

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

A summary of all steps leading to fulfillment of the Convention in terms of legislative, supervisory and administrative activities is described particularly in Articles 19, 20 and in detail in the individual articles of the National Report.

5.2 Legislative and Regulatory Framework

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

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

The history of the development Czech legislation in nuclear safety and radiation protection is described in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1 of February 2003. This section deals only with the currently effective legislation.

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,
- SÚJB Decree No. 214/1997 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. (Sections 46-55).

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.

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 country's preparation to join the EU and in order to enable implementation of obligations resulting from the newly concluded international treaties, the Parliament of the Czech Republic has amended the Atomic Act with Act No. 13/2002 Coll. The changes concern mainly the provisions dealing with radiation protection in order to ensure compatibility with applicable European directives and the provisions dealing with guarantees, which accept Additional Protocol to the Nuclear Weapons Non-proliferation Treaty.

A complete list of legal regulations concerning nuclear energy, ionizing radiation and related regulations is provided in Chapter 12.6. Full texts 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 also the following international treaties acceded by the Czech Republic (or by the former ČSSR and later ČSFR):

- Treaty on timely announcing of nuclear accidents,
- Treaty on assistance in case of a nuclear or radiation accident,
- Nuclear weapons non-proliferation treaty,
- Agreement between the Czech Republic and the IAEA for the Application of Safeguards in connection with the Treaty on the Non-Proliferation of the Nuclear Weapons,
- Convention on physical protection of nuclear materials,
- Vienna Convention on civil liability for nuclear damage,
- Joint Protocol relating to the application of the Vienna and Paris Conventions,
- Convention on nuclear safety,
- Joint Convention on the safety of spent fuel management and on the safety of radioactive waste management,

- Additional Protocol to the Agreement between the Czech Republic and the IAEA for the Application of Safeguards in connection with the Treaty on the Non-Proliferation of the Nuclear Weapons,
- Modified supplementary agreement on technical assistance provided by the International Atomic Energy Agency to the Government of ČSFR,
- Agreement on formation of Korea Energy Development Organization (KEDO),
- Protocol on amendment to the Vienna Convention on civil liability for nuclear damage,
- Convention on additional indemnification of nuclear damages.

Apart from the already mentioned international documents, the Czech Republic has also signed the Comprehensive Nuclear Test Ban Treaty which, however, 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:

- Agreement between Government of the Czechoslovak Socialist Republic and Government of the Republic of Austria on regulation of the issues of mutual interest related to nuclear safety and radiation protection,
- Agreement between Government of the Czech and Slovak Federative Republic and Government of the Federal Republic of Germany on regulation of the issues of mutual interest related to nuclear safety and radiation protection,
- Agreement between Government of the Czech and Slovak Federative Republic and Government of the Hungarian Republic on sharing of information and cooperation nuclear safety and radiation protection,
- Agreement between Government of the Czech Republic and Government of the Slovak Republic on cooperation and state supervision of and nuclear safety of nuclear installations state supervision of nuclear materials.

The legislative framework has been complemented with a number of recommendations and guidelines issued since 1978 by the state nuclear safety supervisory body in a special non-periodic publishing series „Nuclear Installations Safety – Requirements and Guidelines“.

5.2.2 Approval Process, Inspections and Enforcement of Compliance

The basic legal regulations governing the licensing and approval process for nuclear installations are the above-mentioned Construction Act (No. 50/1976 Coll.) and Atomic Act. Other important regulations in this area include Act No. 71/1967 Coll., on administrative procedure, Act No. 552/1991 Coll., on state inspection, 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, as well as other related lower legal regulations.

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 an 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 bodies include in particular:

- technical inspection bodies in respect to conventional safety, including safety of pressure components and electric systems,
- local competent authorities
  - in respect to fire safety,
  - in respect to waste management,
  - in respect to water consumption and discharge of wastewater,
- Czech Environmental Inspection from the viewpoint of air pollution,
- Locally competent public health authority from the viewpoint of safety and health protection at work under Act No. 258/2000 Coll., on public health protection, as enacted later.

In Section 126 paragraph 3 the Construction Act establishes expressly that a construction department, before issuing a sitting licence, construction licence, operation license or any other additional permit concerning a construction which includes a nuclear installation, shall request the applicant to submit a permit issued by SÚJB under the Atomic Act. Pursuant to the Construction Act the construction department shall not issue any license without this permit.

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 in detail defined by Section 39 of the Atomic Act and also by No. 552/1991 Coll., on state inspection, as amended later.

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.

5.3 Regulatory Bodies

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

5.3.1 Mandate and Competence of the Regulatory Body

At the moment the competence of SÚJB is defined by the Atomic Act, Section 3 that 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."

The competence of SÚJB has been 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 a result, the independent supervision has been concentrated in one central agency, which has enabled to improve efficiency of the supervisory activities.

5.3.2 Specification of Powers and Responsibilities of the Regulatory Body

Section 9 paragraph 1 of the Atomic Act establishes 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 para 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 of the license issue (Section 10),
- probity and professional competence of the applicant for a license (Sections 11 and 12),

- content and particulars of the license application (Section 13),
- SÚJB conduct in the administrative proceedings (Section 14),
- requisites of the license (Section 15),
- alteration, cancellation and cessation of the 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, covering:

- 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 inspection and monitoring, provide SÚJB with sufficient powers to execute the state supervision and also means of coercion to enforce fulfillment of 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 in detail described in Section 39 paragraph 1 of the Atomic Act.

SÚJB personnel performing the supervision are nuclear safety and radiation protection inspectors appointed by SÚJB Chairperson. They work at the SÚJB headquarters, at the power plants in Dukovany and Temelín and in the regional centers. Within the supervisory activities the inspectors and SÚJB Chairperson are entitled particularly:

- to enter at any time the supervised buildings, facilities, operations, land and other premises associated with the utilization of nuclear energy or radiation practices,
- to inspect observation of requirements for and conditions of nuclear safety, radiation protection, physical protection and emergency preparedness and condition of the nuclear installation, in compliance with limits and conditions and operating procedures,
- to require evidence of meeting of all specified obligations in assurance of nuclear safety, radiation protection, physical protection and emergency preparedness of the nuclear installation, to perform measurements and collect samples from inspected persons as necessary to inspect compliance with the Act and other regulations based on the Act.,
- to verify professional competence and special professional competence under the said Act,
- to participate in investigation and in liquidation of events important from the viewpoint of nuclear safety, radiation protection, physical protection and emergency preparedness, including unauthorized handling of nuclear items or ionizing radiation sources.

Should an inspector identify deficiencies in activities performed by the inspected person, he shall be authorized, depending on the nature of the identified shortcoming, to:

- require the inspected person to remedy the situation within the a set period of time,
- order to the inspected person to perform technical inspections, reviews or tests of functional capability of the installation, its parts, systems or its assemblies, provided it is necessary for verification of nuclear safety,
- withdraw the special professional competence authorization issued to an employee of the inspected person, in the event of serious violation of his obligations or his failure to meet requirements for professional competence or physical and mental capability,

- propose that a penalty is imposed.

If there is a danger in delay or in case of undesirable situations important from the viewpoint of nuclear safety, radiation protection, physical protection and emergency preparedness, SÚJB shall be authorized to issue a provisional measure imposing on the inspected person the obligation to reduce the power output or suspend operation of the nuclear installation, suspend assembling of components or systems of a nuclear installation, to prohibit handling of nuclear items, ionizing radiation sources or RAW, or to impose on the inspected person the obligation to tolerate that the 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.

5.3.3 Position of the Regulatory Body within the State Administration Structure

The SÚJB, as a succession body of ČSKAE, is an independent central state administration body for the area of nuclear safety and radiation protection. It has its own budget item approved by the Parliament of the Czech Republic within the state budget. A Chairperson appointed by the Czech Government heads the SÚJB. The SÚJB position within the state administration structure is shown in Fig. 5.1.

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

The number of positions approved in the SÚJB budget for 2005 is 194, while approximately 2/3 of the number are nuclear safety and radiation protection inspectors. The SÚJB budget for 2005 is approximately CZK 371 million (1 € ≈ 30 CZK). Given the current conditions in the Czech Republic, the material and human resources are sufficient to fulfill the basic functions required from SÚJB under the law.

The SÚJB organizational structure is shown in Fig. 5.2 and consists of:

- Section of nuclear safety which includes Department of nuclear installations assessment, Department of nuclear installations' inspections and Department of RAW and SF management,
- Section of radiation protection which includes Department of exposure regulation, Department of radiation sources and Department of radiation protection in fuel cycle and Division of assessment of radiation protection activities,
- Section of management and technical support which includes the Office bureau (personnel training, science and research coordination etc.), Department of international cooperation, Department of financial management and administration, Department for control of ban of chemical and biological weapons, Department of nuclear non-proliferation and Legal division,
- independent department of emergency preparedness and crisis management - Emergency crisis center (reporting directly to the SÚJB Chairman)
- other departments reporting directly to the SÚJB Chairman (internal audit, secretariat, Euro unit),
- advisory bodies to the Office Chairperson,

- regional SÚJB centers in Prague, Plzeň, České Budějovice, Ústí nad Labem, Hradec Králové, Příbram-Kamenná Brno and Ostrava, subordinated to the radiation protection section,
- detached workplaces of the nuclear safety section at both the nuclear power plants (Dukovany, Temelín)

SÚJB is also a managing authority for SÚRO, fully funded from the state budget, which provides professional and technical support in radiation protection and for SÚJCHBO, partly funded from the state budget, which provides primary professional and technical support to SÚJB in chemical, biological and radiation protection. Additional professional support to SÚJB is provided by other research institutes (e.g. ÚJV Řež a. s.) and universities on contractual basis.

Responsibilities within the SÚJB organizational structure are defined by the Organization Manual and other internal management documents.

Early in 1998 SÚJB Chairperson established advisory teams of independent experts, separately for nuclear safety and radiation protection. Although law does not regulate activities of the teams they are important advisory bodies for major issues dealt with by SÚJB in nuclear safety and radiation protection.

5.3.5 Regulatory Body within the Structure of Governmental Bodies

As indicated by the above-mentioned Czech legislation and state administration structure, SÚJB has all powers necessary to perform its mission – to carry out the state supervision of nuclear safety, radiation protection, physical protection and emergency preparedness. Meanwhile, the SÚJB competencies neither overlap with nor are in contradiction to other state administration bodies.

5.3.6 Independent Evaluations of the State Supervision

After the changes in the supervisory and legal framework performed in the second half of the 1990s and after their full implementation the Czech Republic approached IAEA to request independent evaluation of the efforts. This was done in form of two international IRRT missions of experts who visited SÚJB in March 2000 and June 2001.

According to the results presented by the experts in their final report from the mission, they found both the legislative framework and performance of the state supervision of peaceful utilization of nuclear energy and ionizing radiation at a very good level corresponding to the good worldwide practices. In respect to the position of the regulatory body within the state administration structure, the experts highlighted the fact that SÚJB has reached independence not only „de jure“ but also „de facto“. The experts also worded specific recommendations whose implementation may further improve the level of supervision in the Czech Republic. The recommendation focused e.g. on special fields of supervision such as practicing of emergency preparedness or further development of use of probabilistic methods in nuclear safety evaluation. However, they positively stated that those recommendations mostly concerned long-lived development of the organization. Reports from both the IRRT missions have been published on the SÚJB website.

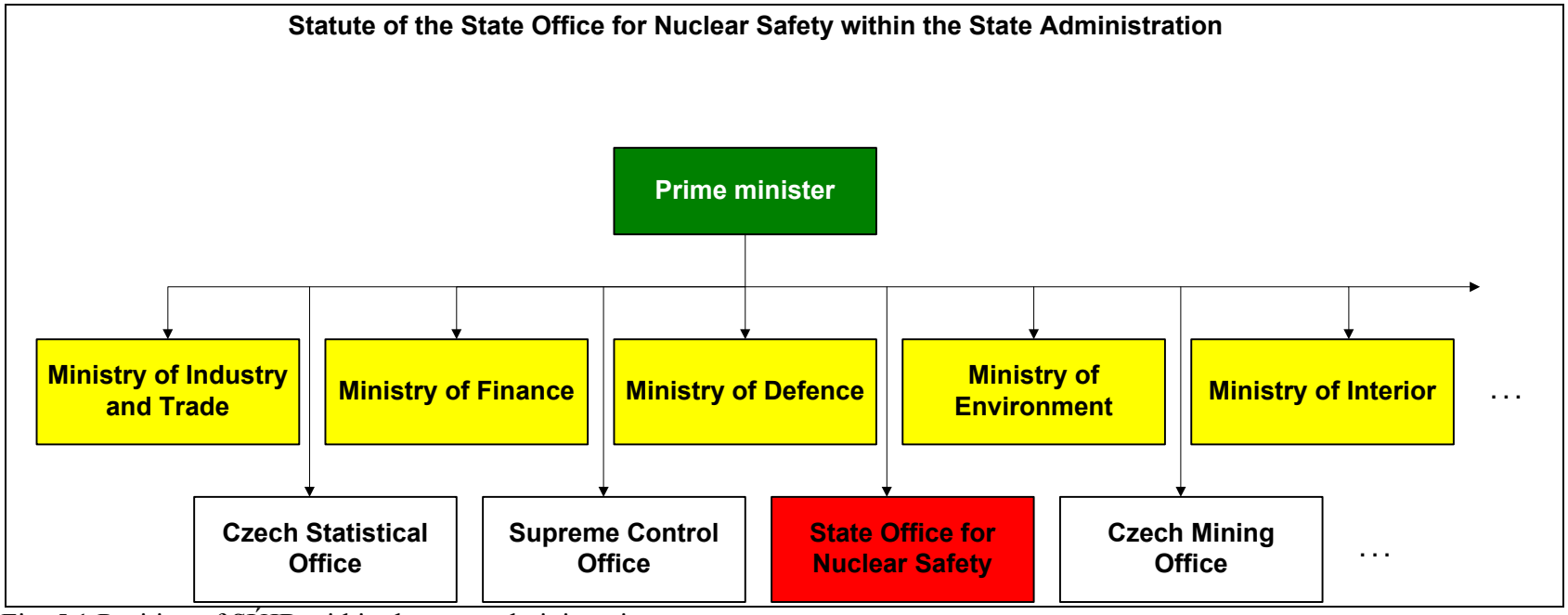

Fig. 5.1 Position of SÚJB within the state administration structure

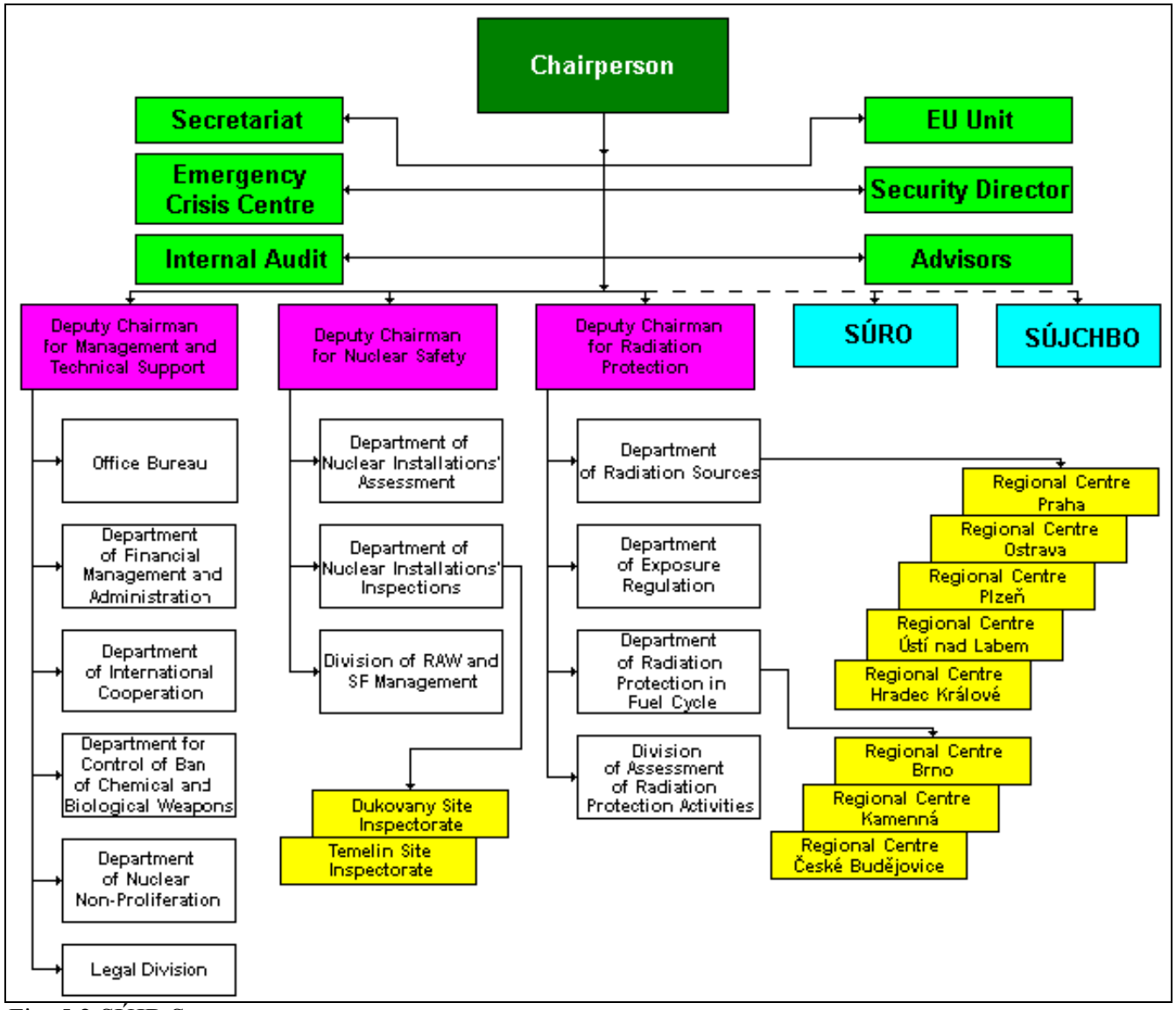

Fig. 5.2 SÚJB Structure

6. Other Generic Safety Provisions – Joint Convention, Articles 21 - 26

6.1 Responsibility of the Licensee

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

The licensee's responsibility for safe management of SF and RAW is defined in the Atomic Act which specifies a number of partial responsibilities of the licensee that would constitute 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, among other things, to ensure nuclear safety, radiation protection, physical protection and emergency preparedness of its respective nuclear installation followed by additional requirements for the nuclear safety assurance system as imposed on the part of the licensee, e.g.

- review and maintain systematically the nuclear safety and radiation protection to keep it up with the latest developments in science and technology;
- observe the technical or organizational terms of safe operation, license terms and conditions, and the approved quality assurance programs;
- investigate promptly any breach of these terms and conditions and adopt corrective actions to prevent recurrence of such events;
- report promptly occurrence of any events important for nuclear safety.

The state supervisor of nuclear safety is mainly responsible to exercise supervision over performance and fulfillment of the above requirements. The rights of the nuclear safety or radiation protection inspectors are specified under Section 39 para 4, letters b), and c) of the Atomic Act. In compliance with this law, the inspectors shall be entitled to inspect observance of the terms and requirements for nuclear safety, radiation protection, physical protection, and emergency preparedness, as well as the condition of nuclear equipment, or adherence to technical specifications and operating procedures and to demand evidence that the specified obligations have been fulfilled.

The joint-stock company ČEZ, a. s. as the holder of license for operation of NPP Dukovany and NPP Temelín, SÚRAO and ÚJV Řež a. s., holds the primary responsibility for nuclear safety and radiation protection of their nuclear installations and repositories. This responsibility is delegated at the executive level to the respective managers where directors of those organizations play the key role in terms of safety. 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

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

(i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;

(ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;

(iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility.

The wording of the Atomic Act in respect to the personnel qualification requirements set forth in Section 18 reads:

"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 with direct impact on nuclear safety and activities especially important for radiation protection, requirements for technical training and qualification, including their testing method, as well as granting of permits to persons authorized to perform the above listed activities, are specified under the implementing regulation which is the Decree No. 146/1997 Coll., as amended by the Decree No. 315/2002 Coll.

Each licensee authorized to operate a NI or a Category III and IV workplace shall be obligated under Section 18, paragraph 1, letter h) of the Atomic Act *„In case an estimate of total costs of decommissioning verified by the Radioactive Waste Repository Authority (hereinafter "the Authority") exceeds 300 000 CZK, steadily make provision[1] for decommissioning of nuclear installation or category III or IV workplace, so that financial resources deposited on a blocked account will be available for preparation and performing of decommissioning, at the required time and in the required amount, in line with the program of decommissioning approved by the Office. Provided the estimate of total costs exceeds 1 billion CZK the licensee shall deposit financial means at the amount of this provision on a blocked account with a bank in the Czech Republic. Yields from means on the blocked account shall be income to this blocked account. The provision shall be expenditure for generating, ensuring and maintaining revenues[1]. Details for making provision shall be established in an implementing regulation. Financial means on the blocked account may be utilized solely for the preparation and an implementation of decommissioning and any drawing on such funds shall be approved by the Authority. The obligation to make provision for the decommissioning shall not apply to organizational units of the state[1a], and state-subsidized organisation[1b], public universities [1c] and organizational bodies and subsidized organizations established by territorial self-governing units[1d]."*

The decommissioning details are specified in the Decree No. 360/2002 Coll. by the Ministry of Industry and Trade which stipulates a method for creating the provision / monetary reserve for decommissioning NIs or workplaces in categories III and IV. Institutional inspections of closed repositories will be paid from the nuclear account funded, in agreement with the Atomic Act, by generators of RAW.

6.2.1 ČEZ, a. s.

The responsibility for nuclear safety and radiation protection of the NIs owned by ČEZ, a. s. rests with the statutory body of this joint-stock company (the Board of Directors) headed by the Managing Director. The Managing Director delegates responsibilities within his/her authority to the Executive Director of the power production division who reports to the Managing Director in respect to nuclear safety and radiation protection assurance of the nuclear installations within his responsibility.

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[1] Act of the Czech National Council No. 593/1992 Coll. on reserves for calculation of the income tax base, as amended later.

[1a] Section 3 of Act No. 219/2000 Coll., on the Czech Republic's property and its acting in legal relations

[1b] Act No. 218/2000 Coll., on budgetary regulations and alterations of some related acts (budgetary rules), as amended later.

[1c] Act No. 111/1998 Coll., on universities and alterations of and amendments to some other acts (Universities Act), as amended later

[1d] Act No. 250/2000 Coll., on budgetary regulations for regional budgets, as amended by Act No. 320/2001 Coll.

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

By the law, the joint-stock company of ČEZ is obligated to remit specific amounts to the nuclear account in order to create the provision for decommissioning of nuclear installations. The amount due to the nuclear account is defined under the Government Order at CZK 50 per each MWh of electricity generated from nuclear plants. A method to create the provision for decommissioning of nuclear installations is defined in a decree issued by the Ministry of the Industry and Trade.

The statutory reserve for decommissioning of NPP Dukovany as created by ČEZ, a. s. amounts to CZK 154.988 mil. per year. The provision for decommissioning of NPP Temelín amounts to CZK 152.864 mil. per year. The statutory reserve for decommissioning of ISFSF amounts to CZK 0.116 mil. per year.

The state organization of SÚRAO inspects and verifies that decommissioning reserves are created for NIs.

Based on an internal decision ČEZ also creates a provision for SF storage. This reserve is funded from the profit and is intended to cover the costs incurred by ČEZ from storage of SF, even upon decommissioning of nuclear units.

By the 31 December 2004, the power utility of ČEZ, a. s. provided the following amounts:

- CZK 6 005.676 mil. paid to the nuclear account;
- CZK 4 683.195 mil. available as the monetary reserve for decommission of NIs (from which the decommissioning provision for NPP Dukovany is CZK 3 884.976 mil., for NPP Temelín CZK 797.697 mil. and for ISFSF Dukovany CZK 0.522 mil.);
- CZK 6 540.180 mil. available as the internal reserve for SF storage (from which for storage of SF from NPP Dukovany CZK 5 846.222 mil. and for storage of SF from NPP Temelín CZK 693.958 mil.).

Note: In connection with the amended Atomic Act of 1 February 2002, the monetary funds corresponding to one-year provisions are deposited on blocked accounts in banks in the Czech Republic. As at 31 December 2004 the funds available on the blocked accounts amounted to CZK 1 580.503 mil. (from which CZK 992.792 mil. for NPP Dukovany and CZK 587.351 mil. for NPP Temelín and CZK 0.360 mil. for ISFSF Dukovany).

6.2.2 ÚJV Řež a. s.

The joint-stock company of ÚJV Řež a. s. shall create a monetary reserve for decommissioning of the HLW storage facility. This NI has been in operation since 1995. The projected lifetime of this facility is fifty years.

It means that the HLW storage facility would be decommissioned in 2045 where its radioactive contents are to be removed to the repository whether – if permitted by the acceptance criteria– the existing type or the underground geological facility that is being designed. If an underground

repository is not available, the requirement for subsequent storage shall be addressed by construction of a new storage or reconstruction of the existing storage facility.

The waste disposal facilities are part of the decommissioning proposal approved by SÚJB. SÚRAO verified the decommissioning cost. By the 30 December 2004, ÚJV Řež a. s. created the decommissioning reserve of CZK 71 137 913 and of that the HLW storage facility provision amounts to CZK 64 500 per year.

The SF and RAW disposal are supported with a sufficient number of the qualified personnel. The number of personnel is based on an analysis of licensed activities and is sufficient to meet requirements for nuclear safety and radiation protection in the course of such activities.

6.2.3 SÚRAO

SÚRAO owns an approved proposal by SÚJB for decommissioning of repositories, and being a state owned organizational unit it shall not create any provision for decommissioning as per Section 18, paragraph 1, letter h) of the Atomic Act. The Czech Government authorizes the SÚRAO budget. The activities under the authority of SÚRAO are supported with a sufficient number of the qualified personnel. The number of personnel is based on an analysis of licensed activities and is sufficient to meet requirements for nuclear safety and radiation protection in the course of such activities.

6.3 Quality Assurance

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

6.3.1 Present State

6.3.1.1 Legal Framework for Quality Assurance

The Act No. 18/1997 Coll. on peaceful utilization of nuclear energy and ionizing radiation and on amendments and alterations to some acts, as amended later (the Atomic Act) defines the general conditions for performance of practices related to nuclear energy utilization, radiation practices, and interventions to reduce exposure. 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. 214/1997 Coll. is the implementing regulation, which established the basic requirements for quality assurance of the classified equipment and their safety classification setting out in detail:

- requirements / activities for implementation of the quality assurance system specified under the Atomic Act,
- requirements for such a quality assurance system,
- quality assurance requirements for the classified equipment with regard to their safety classification,
- requirements for the contents of quality assurance program,
- safety classification and breakdown criteria for the classified equipment,
- scope and method to prepare the list of classified equipment.

As stated in SÚJB Decree No. 214/1997 Coll., Section 2, a quality assurance system shall be implemented in the scope of requirements set forth in the quoted Decree for SF management and RAW management. The quality control system for practices licensed as per Section 9 of the Atomic Act shall be documented with quality assurance programs whose contents are specified under Section 32 of the quoted decree, and the associated quality assurance documentation, and records for any activities important for nuclear safety or radiation protection, and implemented by the licensee prior to issue of a specific license.

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

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

Quality assurance for the SF and RAW management is provided by ČEZ, a. s. during performance of the following nuclear activities:

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

ČEZ, a. s. has implemented and documented a quality management system to support processes and activities in the scope of the above mentioned nuclear activities, which takes into account obligations promulgated in the corporate Quality Policy. This quality management system was designed to support processes and practices in the area of SF management and RAW management in a controlled and organized manner, in full compliance with the Atomic Act and its implementing regulations, including SÚJB Decree No. 214/1997 Coll.

The quality management system implemented for nuclear activities also meets the requirements of the Czech series of standards ČSN ISO 9000 and ČSN ISO 14000 and to the maximum extent observes IAEA recommendations issued under the Safety Series 50-C/SG Q. The quality

management system requirements for nuclear activities of ČEZ, a. s. are applied using a graded approach based on the relevance of each process or item to nuclear safety and radiation protection.

The quality management system for nuclear activities has been integrated into the corporate management system.

On 1 April 2005 an organizational change was introduced in ČEZ, a. s., which merged the original nuclear energy section, as an integrated center managing nuclear activities, with fossil fuel energy section into the power production division of ČEZ, a. s. In this connection a new system of quality management documents is being developed relating to the basic activities. It has been ensured that the transition to the new system of documents is smooth and gradual and that quality assurance requirements are met at any moment in respect to nuclear safety, radiation protection, physical protection and emergency preparedness.

6.3.1.3 Quality Assurance Strategy of SÚRAO

For management of activities associated with disposal of RAW, the Ministry of Industry and Trade established the organization of SÚRAO whose activities are detailed in Chapter 4 of the Atomic Act. SÚRAO has implemented and described a quality assurance system based on the Czech standards of ČSN ISO 9000, ČSN ISO 10 000 and ČSN ISO 14 000, and following the regulatory requirements and IAEA recommendations. The quality assurance system developed and used by SÚRAO allows to:

- meet the regulatory requirements, in particular SÚJB Decree No. 214/1997 Coll. for activities provided by SÚRAO in the scope of its mission, and covered under this Decree,
- meet the requirements of standards or norms,
- follow the Policy approved by the Czech Government which proposes a long-term national strategy to be pursued in this particular field,
- provide efficient management of SÚRAO.

The quality system has been graded based on the relevance of each item or process.

The quality assurance system incorporates principles of the safety culture, which means that quality and safety issues of repositories, being nuclear installations, are given the highest priority.

Requirements under Section 21, SÚJB Decree No. 214/1997 Coll. are thoroughly applied to designing of deep repositories.

6.3.1.4 Quality Assurance Strategy of ÚJV Řež a. s.

The quality management system of ÚJV Řež a. s. is based on application of the EN ČSN ISO 9000 series of standards with the objective to assure quality of products and services for clients, as well as to follow the regulatory standards applicable to the business. The quality assurance procedures enforcing requirements for nuclear safety and radiation protection under the Act No. 18/1997 Coll. as amended are based on the corporate Quality Policy.

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 in a system of management documents. These management documents include:

- strategic documents (e.g. Quality Policy, Safety Policy, etc.) – Level I,
- management documents (ČEZ rules, guidelines and procedures and orders by Managing Director or executive Director) – Level II,
- working documents (e.g. methodic instructions, operating instructions, technological procedures)- Level III.

Outputs from processes and activities (records) are also a part of the ČEZ quality system documentation.

In order to assure quality for nuclear activities, ČEZ has developed PZJ (Quality Assurance Procedures), describing the quality management system of the licensee and the affected processes and activities, including definition of responsibilities of the licensee and its contractors. In most cases PZJ use the above mentioned system of management documents to describe the quality management system.

PZJ are submitted by ČEZ to SÚJB for approval since the approval is required for a license to be issued for particular activities under Section 13 paragraph 5 of the Atomic Act.

PZJ for respective licensed activities are also used to approve refurbishment or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness and major organizational changes in ČEZ, a. s.

PZJ for licensed activities are followed with the supplier's quality plans for components, systems, and services that may affect 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 system of management documents and planning documents.

The management documents are organized into 4 layers. The top layer comprises documents which set forth the quality policy and safety policy, environmental policy and quality management manual. Layer 2 includes rules and regulations, which provide general requirements associated with individual chapters of the quality management manual. Layer 3 and 4 comprise management procedures for individual activities and specific operating procedures and instructions.

The planning documents include:

- plans (long-term, 3-years, yearly),
- quality assurance plans,
- PZJ for individual licensed activity – repositories.

PZJ developed to the requirements of SÚJB Decree No. 214/1997 Coll. describe the scope and method of application in respect to the relevant parts of the quality management system for the performance of individual activities, and determine the scope of application for activities described in the quality management documents.

6.3.1.5.3 Quality Assurance Programs of ÚJV Řež a. s.

ÚJV Řež stores SF from research reactors and RAW generated from some other activities at its own site. RAW collection, transport, processing, and storage are handled in a similar way. In order to assure quality of the above activities, the company has implemented a quality management system described in a quality management manual, management QA procedures, and a set of management documents.

The Integrity and Technical Engineering Division operates the HLW storage facility. The quality management program for activities of the HLW storage facility describing the comprehensive measures to ensure safe operation of the facility was developed in compliance with the Decree No. 214/1997 Coll. A similar function is provided by the quality assurance program for the RAW management.

For the individual element of the quality assurance system to be fulfilled, both the documents focus on application of systematic measures to review, inspect, and improve efficiency of the processes.

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 management and verification at all levels (the so-called process owners). The responsibilities for equipment quality and process verification are provided in management documents, which are a part of the documented quality management system. The responsibility for 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 verifications are given the sufficient authority to identify nonconformities and demand appropriate corrective actions if necessary. The stipulated quality shall be verified by persons who do not perform inspection or verification activities. All employees are entitled to initiate improvements or revisions of the quality management system.

For maintenance and improvement of the quality management system the regular quality instructing and training of ČEZ, a. s. employees is perceived as an investment in quality. ČEZ, a. s. uses an integrated training process for its employees in the scope of quality assurance and improvement at each level of management.

The quality system is evaluated for efficiency and the system is updated periodically at the end of each calendar year. Supervisors at each level of management perform periodic assessment of all processes and procedures in their scope of responsibility aimed to review their condition and

efficiency. The quality management system of NPP Dukovany where ISFSF Dukovany is operated is subject to evaluation on a quarterly basis.

6.3.1.6.2 Quality Assurance Program Efficiency Evaluation in SÚRAO

The supervisory activities are used to provide feedback at each level of management making it possible to demonstrate compliance of the established requirements for quality and the pursued activities. All supervisors periodically review key processes and procedures in their scope of responsibility. An expert for quality assurance provides periodical assessment of the quality system as a whole. The audits (external, internal, or supplier's) are used to identify the state of activities and processes, and to verify efficiency of the quality assurance system of SÚRAO, as well as the systems of suppliers of items important for nuclear safety and radiation protection. A training system has been implemented so that all of the activities are performed and supervised by people with the appropriate skills and qualifications, and the activities especially important for nuclear safety and radiation protection are performed by people qualified as per Decree No. 146/1997 Coll., as amended by 315/2002 Coll.

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

To evaluate efficiency of the quality assurance programs ÚJV Řež utilizes supervision controls, process efficiency assessment and feedback. For this purpose, the following shall be performed:

- validation of input documents;
- identification of supervisory activities in the project design stage (operating activities);
- definition of contingencies and risks;
- proposal of inspection procedures and specification of reference parameters for the processes;
- definition of corrective actions and their verification;
- verification of efficiency of the stipulated 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 discussion of serious events by the company management.

6.3.1.7 Current Practices of State Supervision in Quality Assurance

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

In compliance with the Atomic Act, SÚJB shall approve quality assurance programs of nuclear installations for disposal and storage of SF and disposal and storage of RAW that are essential for issue of 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 having impact on nuclear safety, radiation protection, physical protection, or emergency preparedness of NI / RAW repository,
- NI / RAW repository decommissioning stages,
- management of ionizing radiation sources,
- RAW management,
- management of nuclear materials,
- professional training of selected persons,
- personal dosimetry and other services important for radiation protection.

In review of quality assurance programs, verification is primarily focused on compliance with requirements under SÚJB Decree No. 214/1997 Coll.

SÚJB is also responsible to approve selected documents related to the quality assurance issues where the requirement for approval is stipulated under the Atomic Act.

6.4 Operational Radiation Protection

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:

(i) The radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;

(ii) No individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and

2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:

(i) To keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and

(ii) So that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility:

(i)Measures are taken to prevent unplanned or uncontrolled release of radioactive materials into the environment; and

(ii)In the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.

6.4.1 Summary of National Legislation for Radiation Protection

The radiation protection for nuclear installations in the Czech Republic is regulated by the Atomic Act and its implementing regulation No. 307/2002 Coll., on radiation protection which entirely amended the original Decree No. 184/1997 Coll., on radiation protection requirements.

The radiation protection legislation consistently follows internationally respected principles of radiation protection based on recommendations provided by prestigious international non-governmental expert organizations (ICRP), in particular the ICRP recommendation No. 60 issued in 1990, and associated international basic standards for radiation protection adopted by the intergovernmental organizations, including IAEA. The above rules were also initiated by efforts to harmonize the radiation protection legislation of the Czech Republic with the relevant EU directives, in particular the European Commission Directive 96/29/Euratom of 13 May 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.

The Atomic Act defines a system aimed to protect persons and the environment against non-desirable effects of ionizing radiation. The primary obligations when utilizing nuclear energy and ionizing radiation, as well as the conditions for performance of tasks related to nuclear energy utilization or radiation practices are specified in Section 4 of the Atomic Act. They include particularly the following general obligations:

- make sure that nuclear energy utilization, radiation practices or interventions to reduce exposure due to a radiation incident are justified by benefits that compensate for the risks that will or may arise from performance of such tasks (the justification principle),
- maintain such a level of radiation protection when utilizing nuclear energy or performing radiation practices or interventions to reduce exposure due to a radiation incident that the risk to human life, health and the environment is as low as reasonably achievable when the economic and social aspects are considered (the optimization principle, or ALARA principle),
- reduce personal exposure during radiation practices so that total exposure caused by a possible combination of exposure from all radiation practices does not exceed the aggregate limits of exposure set forth by the State Office for Nuclear Safety (the dose limitation principle),
- reduce personal exposure from involvement in the interventions in case of a radiation incident so that it does not exceed ten times the limits specified for exposed workers unless it is a matter of saving human lives or preventing the development of radiological emergency, potentially causing extensive social and economic consequences.
- intervene to divert or limit exposure if the exposure has reached or without any intervention may reach the level causing immediate damage to health, or the exposure has exceeded or without any intervention may exceed the limits set forth in the implementing regulation, and if the mitigation of damage or detriment to health expected from the intervention is sufficient to justify the damage and cost associated with the intervention. The implementing regulation shall establish the limits and detail the rules for preparation and performance of interventions.

As stated in the Atomic Act, a SÚJB license is required for the activities as listed under Section 9 (siting, construction, commissioning stages, etc. – for details see Chapter 5.2). This requirement also applies to discharging of radionuclides into the environment and to RAW management as well. For the licensees, a number of additional requirements are set forth under Sections 17 through 20 of the Atomic Act. The following requirements focus on radiation protection of a nuclear installation:

- establish radiation protection in the scope corresponding to each license and provide systematic supervision of compliance with the rules of radiation protection;
- follow the terms of the license issued by SÚJB, proceed in compliance with the approved documentation, investigate immediately any breach of those terms or procedures and adopt corrective measures to prevent recurrence of any such event, including the obligation to immediately report to SÚJB of all incidents when any of the exposure limits was exceeded;
- adhere to the technical and organizational conditions for safe operation of nuclear installations prescribed under the implementing regulations,
- participate in the national radiation monitoring network within the scope stipulated by the Government Order,
- report immediately to SÚJB of any variation or event important for radiation protection, or any alteration to the facts critical for issue of a license,
- present information to the public on provisions for nuclear safety and radiation protection, unless the information is deemed state, official or business secret,
- monitor, measure, evaluate, verify, and keep record of the parameters and material facts important for radiation protection in the scope stipulated under the implementing regulations, including radiation monitoring of persons, workplaces and the environment, and keep and maintain records of these facts to be submitted to SÚJB in a manner specified in the implementing regulation,
- limit generation of RAW and SF to the necessary extent,
- process and submit to SÚRAO the data on short-term and long-term generation of RAW and SF, and other data necessary to establish the amount and method of payment to the nuclear account,
- keep track of RAW by the type of waste in such a manner that all the characteristics important for safe handling are evident,
- provide initial and periodic preventive medical checkups at least once a year for workers in category A, and in cases where exposure limits were exceeded as reviewed by the Office, provide extraordinary and follow-up medical checkups if recommended by the Office, and verify the mental capability of those employees who perform tasks that immediately affect nuclear safety
- set up a training and testing system for qualification and special professional competence of employees based on the relevance of their jobs.

In case of a radiation incident, the licensee shall be obligated, in the scope and manner set forth in the internal emergency plan approved by SÚJB, in particular to:

- notify immediately the appropriate municipal office with extended powers, SÚJB and other affected bodies listed in the internal emergency plan, of the occurrence or suspected occurrence of a radiation accident,
- in case of a radiation accident immediately alert the population in the emergency planning zone,
- remove immediately the consequences of a radiation accident from the areas operated by the licensee, and perform actions to protect the personnel and other persons against the ionizing radiation effects,
- provide for monitoring of exposure of the employees and other persons, and release of radionuclides and ionizing radiation into the environment,
- advise the affected authorities of the monitoring results, and the actual and expected situation, and the actions taken to protect the personnel and population, and the actions taken to remove the radiation accident, and of the actual and estimated exposure of persons,
- control and regulate the exposure of employees and persons working to remove the radiation accident from the areas operated by the licensee,
- cooperate to remove the consequence of a radiation accident in the facility of the licensee,
- in the event of a radiation accident, participate in the activities of the national radiation monitoring network.

The rights and obligations applicable to the RAW management are stipulated in the Atomic Act, Chapter four.

The essential Decree to implement the Atomic Act in the area of radiation protection is Decree No. 307/2002 Coll., on the radiation protection. The Decree specifies details of the method and scope applied to protection of individuals and the environment against the undesirable effects of ionizing radiation during radiation practices, medical exposure, emergency exposure, lasting exposure, and potential exposure, thus being used to implement the great majority of authorities given under the Atomic Act in terms of radiation protection. This Decree does not apply to exposure from natural background, i.e. from radionuclides naturally contained in human body, cosmic radiation common on the earth surface, radiation caused by radionuclides present the earth crust intact by human intervention or any other radiation from natural sources of ionizing radiation not modified by human intervention. Decree No. 307/2002 Coll. contains requirements from ICRP recommendation No. 60, IAEA Basic Safety Standards No. 115 and Directive No. 96/29/Euratom.

The Decree No. 307/2002 Coll. *„regulates the below items in compliance with the law of the European Community:*

a) details of the method and the scope of radiation protection during work at the workplaces where radiation activities shall be performed including the details related to delineation, identification, notification and approval of supervised and controlled areas at the workplaces;
b) details referred to performance of work activities associated with an increased presence of natural radionuclides or increased influence of cosmic radiation which lead or may lead to a significant increase in exposure of individuals (hereinafter referred to as „work activities with the increased exposure to natural sources“) in such a way that the affected workplaces and

individuals, measurement scope and guidance levels for interventions to reduce the increased exposures to natural sources shall be set out;

c) *details on the rules for preparation or implementation of remedial actions to avert or reduce exposures as well as the guidance levels for the interventions shall be laid down;*
d) *exemption levels as specified in Basic Safety Standards No. 115 and clearance levels expresses as activity concentration which determine when a material can be released in the environment without a permit, on condition that the effective dose associated with the discharge in the environment shall not exceed 0.01 mSv/year for any individual person and the collective dose associated with the discharge in the environment shall not exceed 1 Sv/year,*
e) *exposure limits, dose constraints, maximum permitted levels of natural radionuclide concentrations in building materials and maximum permitted levels of radioactive contamination of foodstuffs;*
f) *details about the classification of ionizing radiation sources, the categorization of exposed workers and the categorization of workplaces where radiation activities shall be performed;*
g) *technical and organizational requirements, procedures and guidance levels to demonstrate the radiation protection optimization;*
h) *the scope and the method of ionizing radiation source management, handling of radioactive waste and radionuclide discharge into the environment for which the license shall be required, and it regulates the details for ensuring radiation protection during the radiation activities;*
i) *conditions of medical exposures, diagnostic reference levels and usually the rules for exposure of physical persons who voluntarily help the persons undergoing medical exposure;*
j) *technical and organizational conditions for safe operation of ionizing radiation sources and workplaces with ionizing radiation; and*
k) *quantities, parameters and the facts impacting radiation protection and sets out the scope of monitoring, measurements, evaluation, verification, recording, keeping records and the method of data transfer to the State Office for Nuclear Safety (hereinafter referred to as „Office").*

The Decree No. 307/2002 Coll. also stipulates classification criteria for ionizing radiation sources as insignificant, minor, simple, significant and very significant sources (Sections 4 through 10), classification criteria for workplaces where radiation activities are performed (Sections 11 through 15) and classification criteria for radiation personnel (Section 16). The Decree also details the procedures and criteria applicable to radiation protection optimizing (Section 17), including specification of the exposure limits (Sections 18 through 22).

6.4.2 Implementation of Radiation Protection Requirements

6.4.2.1 Dose Constraints

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

The limits are set lower for the population, that is the individuals whose exposure is typically inadvertent and involuntary than 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 training for such a job.

The effective dose constraints set for category A and B radiation workers, i.e. persons above 18 years, whose exposure to the ionizing radiation sources at their jobs is deliberate and voluntary, who have been in a proven manner informed about the possible exposure level at work, as well as about the associated risks, shall be 100 mSv within five consecutive calendar years while the value of 50 mSv shall not be exceeded in one calendar year. For employees in category A, which must include among others all persons working in the controlled areas of nuclear installations, routine and regular monitoring of personal exposure shall be introduced, as well as records of personal doses to be kept at least for 50 years. For monitoring of category A and B workers, Decree No. 307/2002 Coll. also established the so-called derived limits which are easier to track and control and using more directly measurable parameters.

The effective dose constraints for persons aged 16 to 18 (students and apprentices), who get into contact with the ionizing radiation sources deliberately and voluntarily, having been in a provable manner informed about the possible exposure at work, as well as about the associated risks, within specialized training for their work with the ionizing radiation sources, shall be 6 mSv per calendar year.

The general effective dose constraints, that is the limits applicable to any other population, shall be 1 mSv per calendar year, or as specified under the license for operation of Category III or IV workplaces exceptionally 5 mSv within five consecutive calendar years.

The general limits for population in the vicinity of the workplace where radiation activities are being performed shall apply to the average calculated exposure of the critical group of population, and for all routes of radiation from any source of ionizing radiation, and for any radiation practices being considered. If there are no direct data available for calculation conservative estimates of factor variations that may affect propagation of radionuclides or the individual's exposure in the critical group shall be used. In order to facilitate supervision of adherence to the exposure limits for population in the vicinity of a specific installation SÚJB has the right to establish the dose constraints only applicable to radiation from the particular installation to be used as the upper bound for optimizing of radiation protection in respect to the population in the installation vicinity.

6.4.2.2 Conditions for Discharge of Radioactive Material

Discharging of radioactive material from NIs, both liquid and gaseous, is subject to licenses issued by SÚJB as per the provisions of the Atomic Act (Section 9, paragraph 1, letter h), and detailed information, including the criteria for issue of such a license, is given under Sections 56 and 57 of Decree No. 307/2002 Coll. The discharge of materials 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 population due to these releases shall not exceed 250 μSv per year. In addition, the general limit of 1mSv applicable to 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 discharges from nuclear installations are not specified in any regulatory document. They are determined individually by SÚJB for each particular nuclear installation and they are set below 50 μSv/year for both the Czech NPPs. The achieved values of discharges are controlled and evaluated by the plant operators based on a discharge monitoring program approved by SÚJB.

There is an extensive monitoring system in place to monitor the actual discharges provided for by the operators of the nuclear installations, as well as independent measurements performed directly 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 level of radiation protection as reasonably achievable are specified under Section 17 of Decree No. 307/2002 Coll. They shall be reviewed for the licensing process or periodical inspections. For a nuclear installation, the following is included:

- prior to start of operation, alternative solutions considered for radiation protection shall be reviewed and compared, as well as the cost of the associated protection measures, collective doses and doses for the relevant critical groups of population,
- in the course of operation, the received doses shall be reviewed regularly (yearly) depending on the task performed while additional possible actions to ensure radiation protection are considered and compared with similar operations.

The reasonably achievable level of radiation protection may be demonstrated using a procedure which compares the cost of alternative measures to improve radiation protection (e.g. building additional barriers) with the financial assessment of the expected reduction in exposure. The reasonably achievable level of radiation protection is considered as proved and the measure does not need to be implemented if the cost should be higher than the benefit of such a measure. In that respect, the Decree No. 307/2002 Coll. established values of the monetary equivalent of reduction in the collective effective dose for the exposed workers or the population, and that is graded based on the relation of the estimated average effective dose and the exposure limits. The decree also considers the need for valorization of these amounts.

6.4.2.4 Radiation Monitoring in the Vicinity of Nuclear Installations

The operator (licensee) shall be responsible for radiation monitoring in the vicinity of the nuclear installation. A monitoring program authorized by SÚJB shall be followed. This monitoring program shall establish the scope, frequency, and methods of measurement and evaluation of results, as well as the associated reference levels. At present, the monitoring in the vicinity of nuclear installation is performed directly by the operator through its environment radiation monitoring labs. SÚJB shall perform supervision of whether the monitoring program is followed, as well as its own independent measurements.

The dose rate is being continuously monitored in the vicinity of NPP Dukovany and Temelín using a teledosimetric system operated by the NPPs. In addition, there is at least one monitoring point of the national independent timely identification network (see Chapter 6.5) located in the vicinity of each NPP. The dose equivalent from external radiation is monitored in the vicinity of NPP using the local networks of thermoluminiscent detectors controlled by the radiation monitoring laboratory of the particular NPP. Independent of those networks, the relevant regional centers of SÚJB perform measurements using thermoluminiscent detectors. In the present operation, none of the examined levels in any of the mentioned networks have been exceeded.

The environment around the operated NPP Dukovany is regularly sampled and measured by the Radiation Monitoring Lab and the independent Regional Center of SÚJB in Brno. The Environment Radiation Monitoring Lab and the Regional Center of SÚJB in České Budějovice monitors the vicinity of NPP Temelín.

Since the NIs are included in the National Radiation Monitoring Network, the supervisory bodies are periodically provided with summaries of measurement results. In addition, the utility takes its own initiative to issue various information 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 measurements performed in the vicinity of each NPP, in particular aimed to detect and assess any possible radioactive leaks, and to provide a credible basis for decision-making about measures to protect the population. These measurements are performed within the National Radiation Monitoring Network whose function and structure are stipulated under the Decree No. 319/2002 Coll. SÚJB manages activities of the National Radiation Monitoring Network, including its permanent and emergency components. The permanent components are used for monitoring under regular operating conditions while the emergency components are activated under emergency conditions. The regular mode is primarily used for monitoring of the current radiation situation and early detection of a radiation accident while the emergency mode is used to evaluate consequences of an accident. The results of monitoring are reported in annual reports on the radiation situation on the territory of the Czech Republic to the Civil and Emergency Planning Committee, as well as to the public through regional offices, hygienic stations, or libraries.

The permanent components of the Radiation Monitoring Network may be divided into the following groups:

- timely identification network comprising 58 continuously operated measurement points with automated transfer of the measured values to the central database. These are controlled by CHMÚ, and a single measurement point is operated by SÚRO and SÚJCHBO in Příbram,
- territorial TLD network of 184 measurement points equipped with thermoluminiscent dosimeters. This network is operated by the regional centers of SÚJB with assistance of SÚRO,
- local TLD networks of 78 measurement points equipped with thermoluminiscent dosimeters in the vicinity of NPP Dukovany and NPP Temelín operated by NPP and the Regional Centers of SÚJB in Brno and České Budějovice,

- territorial measurement network for air contamination comprising of 11 measurement points equipped with high-capacity aerosol and pollutant sampling equipment operated by SÚRO, and the regional centers of SÚJB, and the NPP environment radiation monitoring labs.
- lab network including 6 laboratories of the regional SÚJB centers, and 3 radiation monitoring labs of SÚRO, and 2 NPP environment monitoring labs equipped to perform gamma spectrometry, or possibly radiochemical analysis of radionuclide contents in the environmental samples (such as aerosols, pollutants, food, drinking water, or feed, etc.)
- mobile teams (aircraft or cars) operated by SÚJB or its regional centers, and SÚRO, the Ministry of Defense, Ministry of the Interior, and NPP Dukovany and Temelín provided with the air (volume activity) and ground (radionuclide deposition) dose rate measurement devices,
- Czech Army network including 15 fixed measurement points of which 2 are under 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 on the territory of the Czech Republic, in particular aimed to provide long-term trends and identify any deviations in a timely manner. The attention is given to artificial radionuclides of which those measurable and traceable are below:

- ^{137}Cs, ^{90}Sr, $^{239+240}Pu$ 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 on comparable with the Europe's standards in respect to its equipment, as well as to 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. SÚJB is authorized under the Atomic Act to issue regulations implementing the act and to issue appropriate licenses for management of ionizing radiation sources and other radiation practices as specified by the act – see Chapter 5.2.2.

SÚJB radiation protection inspectors supervise the radiation protection. At present, there are 52 inspectors in total, at the headquarters in Prague and at seven detached workplaces all over the country referred to as the regional centers. The inspectors shall posses technical skills in the supervised area and have a relevant university degree plus three years of technical experience. The inspectors are appointed by the chairperson of SÚJB – see Chapter 5.3 for more details.

There are three types of supervision:

- standard (routine) supervision performed by the regional centers,

- specialized supervision by a team of experienced inspectors for NPP, mining and processing of uranium, RAW, nuclear medicine, radiotherapeutic sources, radiodiagnostic sources, or the major industrial and natural sources,
- specific ad hoc supervision by supervisory teams consisting of the most experienced inspectors.

A large number of internal supervision guides have recently been prepared, as well as inspection documents, to evaluate different types of supervision, and those are currently used for all types of supervision.

6.5 Emergency Preparedness

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

6.5.1 Applicable Law

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

The Atomic Act, Section 2 also defines the basic terms of emergency preparedness:

- *"Emergency preparedness means an ability to recognize the occurrence of a radiological emergency and, upon its occurrence, to carry out measures specified in emergency plans*
- *Radiation incident means an event resulting in an inadmissible release of radioactive substances or ionizing radiation, or an inadmissible exposure of individuals,*
- *Radiation accident means radiation incident requiring urgent measures in order to protect the population and environment,*
- *Radiological emergency means a situation following the radiation accident or such radiation incident or such increase in level of radioactivity or exposure which require urgent action in order to protect individuals,*
- *Emergency plan means a set of planned measures to deal with a radiation incident or radiation accident and to limit their consequences which is elaborated for:*
  - *Nuclear installation premises or workplaces in which radiation activities are performed (on-site emergency plan),*
  - *Transport of nuclear materials or ionizing radiation sources (emergency rule),*

- *The region in the vicinity of the nuclear installation or the workplace with a source of ionizing radiation where, based on results of analyses of potential radiation accident consequences, emergency planning requirements are in force and which is called emergency planning zone (off-site emergency plan).”*

The section also explains the concept of emergency exposure of persons due to a radiation incident or a radiation accident, and emergency exposure of intervening individuals, or lasting exposure resulting from long-term after-effects of a radiological event.

This section also defines:

- NIs including RAW repository, except of the repositories containing solely natural radionuclides, or RAW storage facilities with activity exceeding the values set out in the implementing guide,
- *„Radiation activity which involves an activity that may increase the exposure of individuals to radiation from an artificial sources of ionizing radiation, except activity in the case of radiological emergency.“*

As per Section 3 of the Atomic Act, SÚJB shall be empowered e.g. to:

- *„Approve the on-site emergency plans, or their changes subject to discussion of interfaces with the off-site emergency plans; the on-site emergency plan shall be approved prior to granting a commissioning and operating license for any nuclear installation or workplace where radiation activities are performed,*
- *Approve the emergency rules for transport of nuclear materials or radioactive substances specified under the relevant implementing legal regulation,*
- *Establish the emergency planning zone, or if applicable, its further structuring upon request of the licensee,*
- *Control the activity of the National Radiation Monitoring Network and support the function of its head-office,*
- *Support the activity of the Emergency Response Center and international exchange of data related to radiation situation,*
- *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.“*

The Atomic Act, Section 4 sets forth general conditions for interventions aimed to eliminate or reduce exposure during radiation incidents, or exposure of the intervening persons. These conditions are detailed in SÚJB Decree No. 307/2002 Coll., on radiation protection.

The Atomic Act, Section 17 requires the licensee, as part of his general obligations, to ensure emergency preparedness, including verification in the scope of each license, and to report to SÚJB immediately on any variance relevant for emergency preparedness, including any changes to the facts critical for issue of the license.

Provisions of Section 18 of the Atomic Act set forth, among other obligations of the licensee, the responsibility to:

- *Monitor, measure, evaluate, verify and record values, parameters and facts impacting on emergency preparedness, to the extent laid down in an implementing regulations,*
- *Keep and archive records of ionizing radiation sources, facilities, materials, activities, quantities and parameters and other facts related to emergency preparedness, and submit the recorded information to the Office in the manner set out in an implementing regulation,*
- *Ensure systematic supervision of observance of emergency preparedness, including its verification.“*

The Atomic Act, Section 19, paragraph 1 establishes the following obligations for the licensee in case of a radiation incident occurence, in the scope and manner specified in the on-site emergency plan approved by SÚJB:

- “*In accordance with a special legal regulation, notify immediately the relevant municipal offices with extended powers, the Office and other relevant bodies specified in the on-site emergency plan of the occurrence or suspected occurrence of a radiation accident,*
- *Remove promptly the consequences of the radiation incident from the premises where his activities are performed and take steps to protect employees and other persons from the effects of ionizing radiation*,
- *Provide monitoring of exposures of employees and other persons and prevent any leaks of radionuclides or ionizing radiation into the environment,*
- *Advise the relevant bodies especially of monitoring results, actual or anticipated progress of the situation, interventions taken to protect employees and the public, and interventions taken to remove the radiation incident as well as of the actual and anticipated exposure of individuals,*
- *Control and regulate exposure of employees or persons participating in removal of the radiation incident on the premises where his activities are performed,*
- *Cooperate to remove the consequences of the radiation incident that occurred on his premises.”*

The Atomic Act, Section 19, paragraph 3 sets forth the obligation of the licensee to submit the necessary data to the appropriate regional authority and the involved municipal offices with extended powers in order to prepare the off-site emergency plan, and to provide cooperation to establish emergency preparedness in the emergency planning zone in the scope as per the government order, and to share the cost of provisions for the emergency preparedness.

Details and requirements applicable to emergency preparedness for extraordinary events (radiation incidents or accidents) are specified in the following implementing regulations of the Atomic Act:

- SÚJB Decree No. 318/2002 Coll., on the details for emergency preparedness assurance at nuclear installations or workplaces with sources of ionizing radiation, and on requirements for the content of on-site emergency plans and emergency rules,
- SÚJB Decree No. 307/2002 Coll., on the radiation protection, and
- Government Order No. 11/1999 Coll., on the emergency planning zone.

The SÚJB Decree No. 318/2002 Coll. defines, as another term from the area of emergency preparedness, the extraordinary event, and provides the details to establish emergency preparedness at nuclear installations or workplaces where radiation activities are performed:

- identification of extraordinary event occurrence,
- assessment of the extraordinary events significance and their classification in three basic degrees,
- announcing an extraordinary event,
- management and implementation of the intervention,
- methods to limit exposure of the employees and other persons,
- training of the employees and other persons,
- verification emergency preparedness.

The Decree also specifies the following:

- requirements for intervention procedures and instructions,
- medical support principles,
- documentation requirements for actions during an extraordinary event,
- requirements for data submitted to SÚJB concerning the occurrence and development of an extraordinary event,
- testing and verification requirements for emergency preparedness,
- requirements for the content of an on-site emergency plan and emergency rules,
- documentation maintenance requirements for an extraordinary event,
- additional documentation requirements for emergency preparedness.

Concurrently, the Decree establishes the scope of documentation to be provided by the licensee for emergency preparedness, i.e. on-site emergency plans and intervention instructions, for each category of workplaces[2] where radiation activities are performed, as well as the requirement for their periodical revision once in three years.

The Decree No. 307/2002 Coll., Sections 98 through 103 sets forth for interventions during an extraordinary radiation event:

- general rules for the preparation and execution of interventions aimed to eliminate or reduce the emergency exposure,
- principles for decision making and implementation of the emergency protective measures to limit exposure of the individuals and the environment, including the intervention level limits

The Act No. 239/2000 Coll., on the Integrated Rescue System, as amended later, defines the basic and other units of the Integrated Rescue System, their scope and power of the regulatory bodies and the regional or municipal authorities, and the rights and duties of legal entities or natural persons applicable to the preparation for extraordinary events, and the process of rescue and removal work, and protection of the population in case of emergency, including radiation accidents. This Act stipulates the basic requirements for regional offices and municipal offices

[2] The categories are specified under SÚJB Decree No. 307/2002 Coll., on radiation protection.

with extended powers in respect to preparation of the off-site emergency plans for rescue or removal work in the emergency planning zones being part of the regional crisis plans developed pursuant to Act No. 240/2000 Coll., on crisis management (Crisis Act), as amended later. This Act also stipulates the obligations of regional offices, municipal offices with extended powers, and legal entities or natural persons in relation to management of crisis situations on the territory affected by an extraordinary event.

The Act No. 240/2000 Coll., on crisis management (Crisis Act), as amended later, defines the scope and power of the regulatory bodies and the regional or municipal authorities, and the rights and duties of legal entities or natural persons applicable to the preparation for extraordinary events, and to their solution. It addresses the issue and role of the safety boards in respect to crisis preparedness and the crisis staff in case of emergency. It stipulates the requirements for development of a crisis plan for the central state administration bodies, and the regional state administration bodies, as well as the local governments, or when an emergency state is declared.

The Government Order No. 462/2000 Coll. as authorized by Act No. 240/2000 Coll. stipulates the requirements for crisis documents, which may be potentially misused and which shall be treated as special facts. It also specifies the requirements and method of development for a crisis plan of the central and regional state administration bodies or the local governments (regional offices, municipal offices with extended powers and municipal offices), and the emergency preparedness plans of legal entities or natural persons in business to keep on alert and be prepared to implement the crisis measures and protect against the effects of crisis situations.

The Decree by the Ministry of the Interior No. 328/2001 Coll., as amended later specifies the details of provision for the Integrated Rescue System. It also stipulates the principles and method of development, approval a use of the off-site emergency plan for the defined emergency planning zone of a nuclear installation or a workplace with a very important source of ionizing radiation.

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

6.5.2.1 Classification of Extraordinary Events

In order to evaluate the importance of extraordinary events that might occur during operation of a nuclear installation or a workplace where radiation activities are performed, the events are classified in three basic levels (Section 5 of SÚJB Decree No. 318/2002 Coll., as amended later):

- *„Level 1 – An extraordinary event that might or shall result in non-permissible exposure of employees and other individuals, or non-permissible radioactive release into the environment of a nuclear installation. Level 1 event may be a radiation incident of limited or local nature, and it can be removed using the forces and means of the operating or shift personnel,*
- *Level 2 – An extraordinary event that might or shall result in significant non-permissible exposure of employees and other individuals, or non-permissible radioactive release into the environment which does not require to perform actions to protect the population and the environment; Level 2 event can be resolved by activation of the intervening persons of the*

licensee, that is using the forces and means of the licensee, or the forces and means contracted by the licensee.

- *Level 3 – An extraordinary event specified in the off-site emergency plan that might or shall result in significant non-permissible radioactive release into the environment, and it requires to perform immediate actions to protect the population and the environment; Level 3 event requires not only activation of the intervening persons of the licensee plus the intervening persons under the off-site emergency plan, but even other affected bodies must be involved."*

6.5.2.2 National Emergency Preparedness and Response Systems

In compliance with the legislation, in particular for the area of crisis management, the emergency preparedness system was established in the Czech Republic for various crisis situations. Figure 6.1 outlines 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.

Concurrently with the resolution No. 391 of 1998 the government also established a Committee for Civil and Emergency Planning, as a standing working body of the National Safety Board, to coordinate and to plan provisions for internal national security, protection of population and economy and coordination of requirements for civil resources necessary to assure safety 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.

The main tasks in planning of and preparedness for crisis situations, including radiation accidents, are specified by the rules of procedure of the Committee for Civil and Emergency Planning. The tasks focus on protection of internal national security, protection of population and economy, particularly on:

- operative interdepartmental coordination of planning and preparatory activities,
- assessment and consideration of planning, policy-making and preparatory activities submitted by central state administration bodies,
- assessment and consideration of requirements made by central state administration bodies for civil resources,
- discussing and evaluation of interdepartmental commenting procedures on materials and recommending of materials to be discussed by the National Safety Board,

- assessment, discussing and coordination of activities performed by representatives of the Czech Republic in NATO bodies and in other international entities,
- processing and coordination of activities in the area of humanitarian aid and rescue works.

The Committee for Civil and Emergency Planning is presided by the Minister of the Interior and its members are deputies of ministers and the SÚJB chairperson. The Committee has also established specialist working groups.

The groups are made up of experts (specialists) in respective fields of population and environmental protection in case of extraordinary events (industrial accidents, natural disasters etc.).

The Central Crisis Staff was instituted at the national level as the working body of the National Safety Board to handle crisis situations, including radiation accidents. The Central Crisis Staff is presided by the Minister of the Interior. Other members of the Central Crisis Staff include deputies of ministers and senior executives of other central state administration bodies, including SÚJB chairperson.

The Central Crisis Staff is activated also in case of a radiation accident outside the Czech Republic's territory, provided the Czech Republic's territory may be affected by the accident, and in case of radiation accidents during transport of nuclear material and radioactive substances.

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

The nuclear installations or workplaces where radiation activities are performed, that is also the SF or RAW management activities, shall prepare both the on-site emergency plans and intervention instructions in compliance with SÚJB Decree No. 318/2002 Coll. This obligation applies to:

- RAW Repository and RAW storage facilities assigned to Category IV workplaces pursuant to SÚJB Decree No. 307/2002 Coll., and
- workplaces where radiation activities are performed, including the RAW and SF management assigned to Category IV and III workplaces pursuant to SÚJB Decree No. 307/2002 Coll.

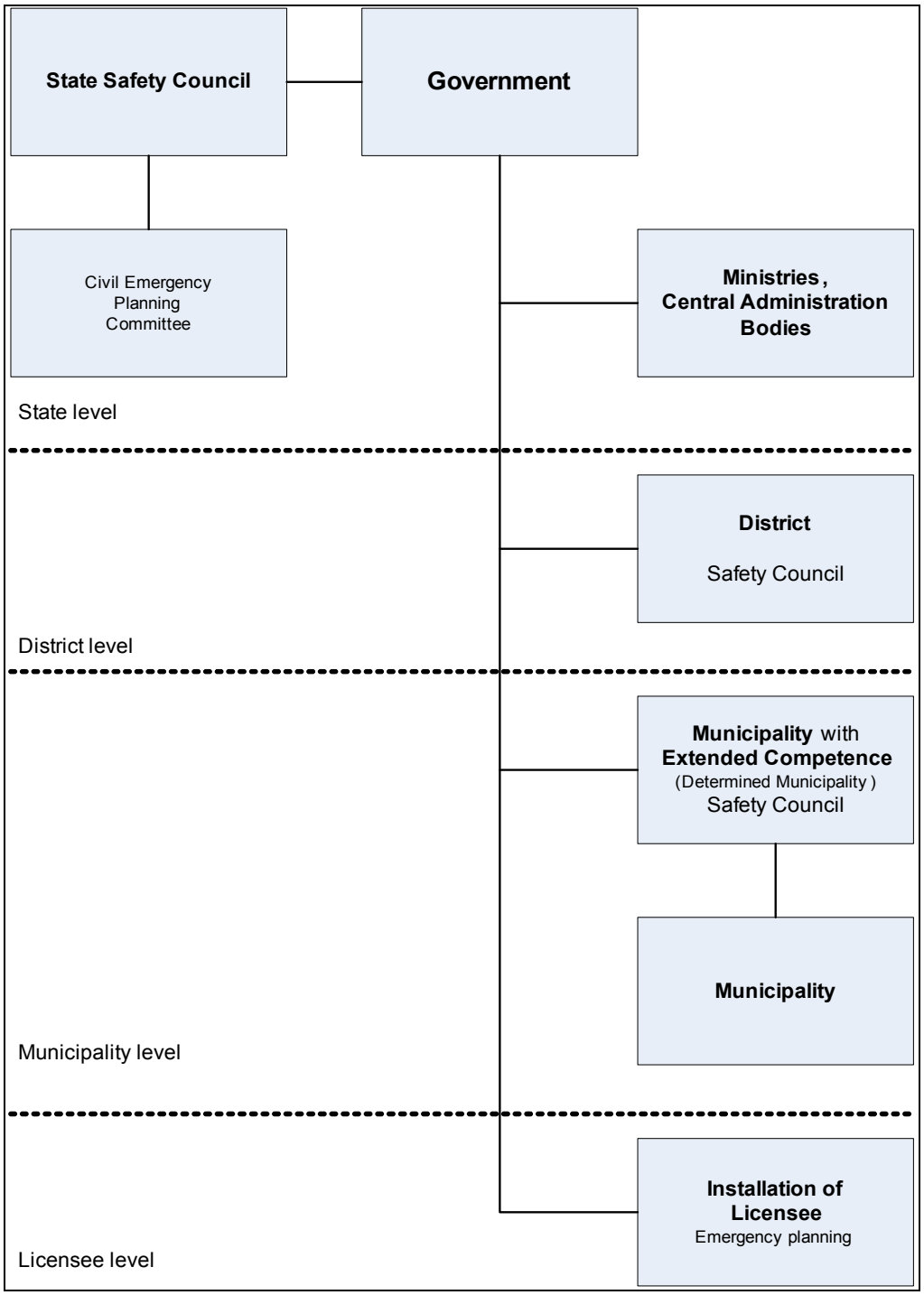

Fig. 6.1 Basic structure of emergency preparedness in the Czech Republic in case of an extraordinary event

The development of emergency preparedness documents in the scope specified above applies specifically to the following licensees:

- ČEZ, a. s.
  - NPP Dukovany (NI),
  - NPP Temelín (NI),
- SÚRAO
  - RAW repository Dukovany (NI),
  - RAW repository Richard (NI),
  - RAW repository Bratrství,
- ÚJV Řež a. s. (NI),
- ISOTREND s.r.o. Praha,
- ZAMSERVIS s.r.o. Ostrava,
- WADE, a. s.
- ALLDECO CZ, a. s.

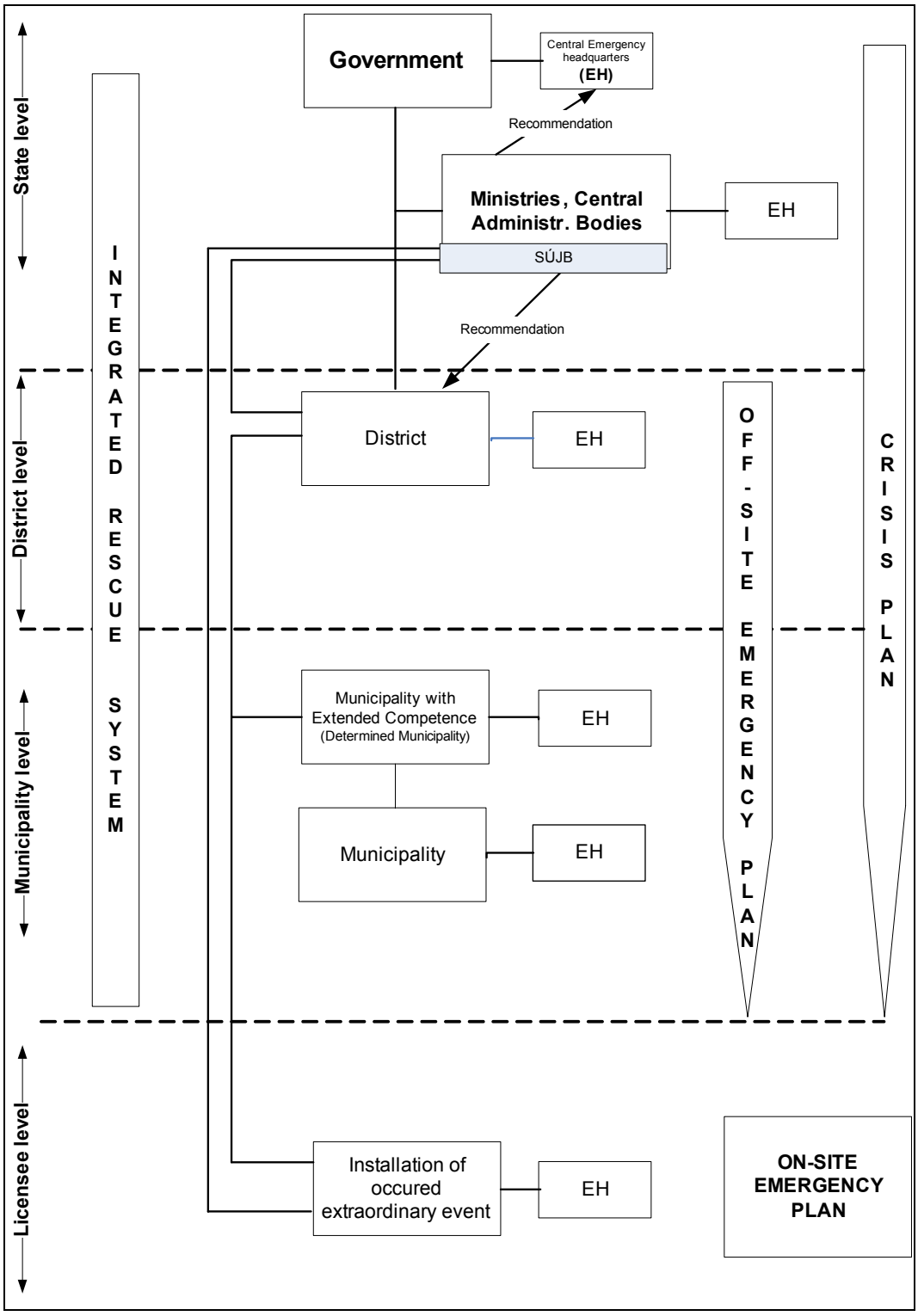

Fig. 6.2 Basic chart of crisis response in the Czech Republic at occurrence of a radiation accident

The requirements for content of an on-site emergency plan are specified by SÚJB Decree No. 318/2002 Coll. (Section 15). The on-site emergency plans shall always contain:

a) an introductory part including
   1. basic data about the licensee,
   2. subject matter and scope of performed activities, including contact data,
   3. place where the activities are performed and their duration,
b) anticipated extraordinary events of the individual degrees, stating methods of their identification under and evaluation of their seriousness,
c) methods and systems to announce extraordinary events,
d) methods to limit exposure of employees and other persons,
e) methods to verify emergency preparedness,
f) intervention procedures ,
g) methods of medical provision of the employees and other persons,
h) methods of data transmittal to the Office,
i) list of state administration bodies and other relevant bodies in agreement with Section (Section) 19 paragraph 1 letter e) of the Act.

Holders of operating licenses for nuclear installations thus prepare their on-site emergency plans to include extraordinary events in the RAW management. For NPP Dukovany, the on-site emergency plan also includes SF management for ISFSF Dukovany. The on-site emergency plan of ÚJV Řež a. s. encompasses its entire site while there are associated emergency plans provided for each building where radiation activities are performed. The requirement for emergency preparedness, including the SF management, applies to the research reactor buildings of LVR–15 and the HLW Storage Facility.

SÚJB shall approve on-site emergency plan documentation; also any change or amendment to such documentation is subject to approval by SÚJB. SÚJB is responsible for supervising of ensuring the emergency preparedness of each licensee, in particular of the approved on-site emergency plan.

6.5.2.4 Off-site Emergency Plans

In compliance with the Act No. 18/1997 Coll. and the Government Order No. 11/1999 Coll., the analyses were performed for the above mentioned NIs to determine the potential for occurrence of radiation accident and the associated impact on the population and environment. These analyses were submitted to SÚJB for review. For NPP Dukovany and NPP Temelín, SÚJB decided to determine emergency planning zones based on the assessment of considered extraordinary events and their consequences in terms of technologies of a nuclear installation designed to generate electric power.

Based on the review of analyses completed for the affected workplaces with RAW or SF management, and the assessment of the considered extraordinary events plus their consequences in terms of the RAW and SF management, and for the RAW repository Dukovany also considering the existing emergency planning zone, no additional emergency planning zones were determined by SÚJB.

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

Off-site emergency plans are in agreement with the requirements of the Decree by Ministry of the Interior No. 328/2001 Coll. divided into:

A. Information part,
B. Operational part
C. Plans of specific activities

The information part includes:

a) general characteristics of the nuclear installation or workplace with a very significant source of ionizing radiation,
b) characterization of the location, particularly in terms of demography, geography, climate and description of the infrastructure on the location,
c) list of municipalities, including their populations, and list of legal and natural persons conducting business covered by the off-site emergency plans,
d) results of analyses of potential radiation accidents and radiological consequences for population, animals and the environment,
e) system of classification of radiation accidents according to the on-site emergency plan,
f) requirements for protection of population and the environment in respect to intervention levels during a radiation accident,
g) description of structure of emergency preparedness organization in the emergency planning zone, including specification of competencies of its individual units to perform necessary activities,
h) description of a notification and warning system, which contains links to the licensee and communication of information within the emergency preparedness organization in the emergency planning zone.

The operational part contains a summary of planned measures to be performed after a notification about a suspected radiation accident or confirmation of a radiation accident by the licensee.

The operational part includes:

a) tasks of the concerned administration authorities, municipalities and bodies,
b) method of coordination in radiation accident management,
c) criteria to declare corresponding crisis situations provided the off-site emergency plan is obviously not sufficient to deal with the radiation accident,
d) method to assure information flows when managing removal of radiation accident consequences,
e) principles for activities in case the radiation accident consequences spread or may spread beyond the emergency planning zone and for cooperation of the concerned administration authorities and municipalities,
f) forms, methods and procedures to provide information to the population in the emergency planning zone about:

- the nature of potential threat,
- the planned measures to protect the population,
- the actual threat of the population and subsequently adopted measures to protect the population.

The plans of specific activities establish procedures for introduction of individual measures in the following areas:

1. notification,
2. warning to population,
3. interventions by units of the integrated rescue system,
4. population sheltering,
5. iodine prophylaxis,
6. evacuation of persons,
7. individual protection of persons,
8. decontamination,
9. monitoring,
10. regulation of movement of persons and vehicles,
11. medical care,
12. protection of livestock,
13. regulation of distribution and consumption of food, animal feed and water,
14. measures in case of fatalities in a contaminated area,
15. assurance of public order and security,
16. communication with public and media.

6.5.2.5 SÚJB Response to Extraordinary Event

In compliance with provisions of the Atomic Act for occurrence of a radiation incident or accident, SÚJB shall support the activity of ERC, manage activities of the National Radiation Monitoring Network and function as its headquarters. In compliance with provisions of the Crisis Act, ERC is the crisis management center, i.e. it also provides support for the activity of the Crisis Staff including the contact point service intended to be continuously receiving and passing information on the occurrence of a radiation incident or accident.

For any occurrence of extraordinary event, the Crisis Staff activity at the ERC 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

NIs and workplaces where radiation activities are performed shall develop theoretical and practical training plans for their personnel and other individuals or components to handle extraordinary events of each level.

Emergency drills are performed based on a plan of emergency drills which specifies the focus, scope and dates of drills and, if applicable, their frequency. The plan of emergency drills is developed for each calendar year and by the end of the preceding calendar year the plan is submitted to SÚJB.

The plan of emergency drills to verify activities under the emergency plan and intervention instructions concentrates on practicing of the following activities:

- drill of intervention procedures or intervention instructions for extraordinary events of level one or two, which is performed once a year,
- drill of intervention procedures and related intervention instructions for an extraordinary event of level three, which is performed at least once in two years.

Each emergency drill consists of preparatory, implementation and evaluation stages.

The preparatory stage uses the plan of emergency drill as a basis and results in an emergency drill scenario, which specifies:

- objective, scope and duration of the drill,
- identification of occurrence and type of the extraordinary event and its development in the course of the drill,

- specification of intervention procedures and instructions to be practiced,
- specification of evaluators and observers of the drill.

The implementation stage means execution of the drill in agreement with the previously prepared scenario of the emergency drill, in presence of all persons managing and performing the intervention, including evaluators or, if applicable, observers of the drill.

In conclusion the drill is evaluated and the results are summarized in a final report.

For each calendar year a summary evaluation is performed of completed emergency drills and submitted to SÚJB. Considering shortcomings identified in the course of the drills the licensee adjusts its technical, organizational and personnel conditions and the on-site emergency plan and intervention instructions.

Emergency preparedness in the emergency planning zone is verified by drills under the off-site emergency plan for an extraordinary event of level three – radiation accident. The drills are prepared by the regional office in cooperation with the licensee. The parties involved in the drills include the licensee, regional office, components of the integrated rescue system (fire brigade, police, and medical service) and other bodies and organizations covered by the off-site emergency plan and SÚJB.

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

6.5.2.7 Supervision by SÚJB

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

- applicability of the 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 supervision, SÚJB is also responsible for supervision of emergency drills monitoring scenarios of occurrence and development of a simulated extraordinary event, activities in management and performance of interventions under the on-site emergency plan and the associated intervention instructions.

6.6 Decommissioning

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

(i) Qualified staff and adequate financial resources are available;
(ii) The provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;
(iii) The provisions of Article 25 with respect to emergency preparedness are applied; and
(iv) Records of information important to decommissioning are kept.

6.6.1 Summary of National Law for Decommission

Decommissioning of NIs in the Czech Republic is regulated by the Atomic Act 18/1997 Coll. as amended and its implementing regulation issued by SÚJB No. 185/2003 Coll., on decommissioning of nuclear installations and workplaces in categories III or IV, as well as the SÚJB Decree No. 307/2002 Coll., on radiation protection.

According to the Atomic Act 18/1997 Coll. as amended, decommissioning of a NI is one of the activities associated to utilization of nuclear power, and decommissioning is defined as a set of activities aimed to clear nuclear installations or workplaces where radiation activities were performed to be used for other purposes.

The Atomic Act18/1997 Coll. as amended, Chapter three sets forth the conditions for utilization of nuclear power and ionizing radiation in respect to the activities associated with utilization of nuclear power. In Section 9, this condition means a license issued to an applicant by SÚJB based on its competency defined under Section 3 thereunder. As stated in Section 3, SÚJB shall also approve the documentation required by this Act for the particular license applications. The license shall be issued for each stage of decommissioning of a nuclear installation as stated under Section 9, paragraph 1, letter g) in the scope and manner set forth in the implementing regulation, which is SÚJB Decree No. 185/2003 Coll.

The preparation for decommissioning shall be included in each stage of lifecycle of a nuclear installation. The siting license documentation for a NI shall include as Stage 1 of decommission within the Initial Safety Report a draft concept for safe termination of the operation. The licensing documentation for construction of a NI shall include as part of the Preliminary Safety Report the method for safe decommissioning of the installation or workplace being licensed, including disposal of RAW. The licensing documentation for each commissioning stage of a NI for the initial fuel load shall also include the proposed method of decommissioning approved by the Office, as well as the estimated costs of decommissioning verified by SÚRAO. The operating license documentation for a NI shall include the proposed method of decommissioning approved by SÚJB, as well as the estimated costs of decommissioning verified by SÚRAO. The scope and method used to realize the proposed method of decommission as approved by SÚJB are specified under the presently effective SÚJB Decree No. 185/2003 Coll.

The evaluation of environmental effects of decommissioning shall be a prerequisite for issue of the decommissioning license if stipulated under a special regulation (Act No. 100/2001 Coll., on

the environmental impact assessment and amendment to some of the associated laws). The applicant shall be obligated to submit the required documentation as part of the decommissioning license application. The binding contents of the license documentation for each stage of decommissioning of a nuclear installation are provided in an Annex to this Act.

The decommissioning license documentation to be approved by SÚJB shall comprise the RAW management specifications for the process of decommissioning, the scope and method of measurement, and the evaluation of personal exposure and contamination of the workplace plus its vicinity with radionuclides and ionizing radiation, and the on-site emergency plan. In the event that RAW would be originated while decommissioning, the application shall be documented as per Section 13 of the Atomic Act 18/1997 Coll. as amended with a provision for the safe RAW management, including funding of this management. The approved Quality Assurance Program shall be another prerequisite for issue of the decommissioning license. The licensee shall submit to SÚJB for approval the decommissioning programs specified under the license.

For decommissioning of a nuclear installation, the holder of the operating license is liable under the provisions of Atomic Act 18/1997 Coll. as amended, Section 18, and based on the estimated total cost of decommissioning, as verified by SÚRAO, to steadily create a provision so that monetary funds deposited on a blocked account are available for the preparation and execution of decommissioning in a timely manner and in a sufficient amount in compliance with the decommissioning proposal approved by SÚJB. Decree No. 360/2002 Coll. stipulates the method of creating the provision for decommissioning of a nuclear installation or workplace in category III or IV. The funds kept on a blocked account shall only be used for the preparation and execution of decommissioning and drawing on such money is subject to approval by SÚRAO.

This Act also defines exceptions to the obligation to create the provision, specifically state organizations, public universities or local government bodies, where decommissioning costs shall be born by the state.

Provisions created by holders of operating licenses for decommissioning of their installations shall be supervised and drawing on the provisions shall be approved by SÚRAO, which has been set up by the Ministry of Industry and Trade as a state organization to perform the activities associated with disposal of RAW.

Details of and requirements for the method and scope of decommissioning and radiation protection assurance in the course of decommissioning of nuclear installations are specified in the following implementing regulations of the Atomic Act 18/1997 Coll. as amended:

- SÚJB Decree No. 185/2003 Coll., on decommissioning of nuclear installations and workplaces in categories III or IV, and
- SÚJB Decree No. 307/2002 Coll., on radiation protection.

6.6.2 Supervision

The license for each decommissioning stage of a NI and approval of the required documentation using the appropriate administration proceedings, as per Section 9, paragraph 1, letter g) of the Atomic Act 18/1997 Coll. as amended, shall be preceded by an on-site inspection. Prior to approval of the method proposed for decommissioning of a nuclear installation, the supervision

shall cover the approval process for each decommissioning stage of the nuclear installation, as per Section 9, paragraph 1, letter c), and for operation of the nuclear installation, as per Section 9, paragraph 1, letter d).

Decommissioning of NI is supervised by SÚJB radiation protection inspectors. There are 2 inspectors of the headquarters in Prague earmarked for the task. Other inspectors of radiation protection or nuclear safety from the SÚJB headquarters, as well as inspectors of the SÚJB regional centers, may get involved on as-needed basis and based on the required qualification.

The supervision shall be performed within the scope of SÚJB competence to perform supervision, as set forth under the Atomic Act 18/1997 Coll. as amended and based on internal SÚJB guidelines.

In the process of nuclear installation decommissioning SÚJB inspectors from the SÚJB headquarters, regional centers and local inspectors will mutually cooperate. Also, continual supervision by local NPP inspectors is foreseen during decommissioning similar to that during the commissioning and operation of such installations.

7. Safe Management of SF – Joint Convention, Articles 4 - 10

7.1 General Safety Requirements

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

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

The general safety requirements are incorporated in the supreme law, that is the Atomic Act of the Czech Republic. Chapter two of this Act regulates the general conditions for performance 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 proceed 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 legal framework to detail the basic requirements contained in the Atomic Act. The decrees are generally binding regulations and their observation is mandatory for any person who performs or provides support for activities associated with utilization of nuclear power, that is designers, manufacturers, or operators, as well as the regulatory bodies.

The basic safety requirements for commissioning and operation of any NI are given under Decree No. 106/1998 Coll., on the provision for nuclear safety and radiation protection of nuclear installations during their commissioning and operation.

The detailed regulatory requirements for subcriticality and heat sink under the SF management are given under Section 47 of Decree No. 195/1999 Coll., on the requirements for nuclear

installations to provide for nuclear safety, radiation protection, and emergency preparedness, which stipulates that:

„The installation for the management of the irradiated and spent nuclear fuel and its storage, and for the handling and storing the other substances containing the fissile products and radioactive substances shall be designed so that it may be possible

a) to prevent with margin the achievement of criticality even under conditions of the most effective deceleration of neutrons (optimum moderation) by area arrangement or by other physical means and procedures, and thus prevent
   1. the exceeding the 0.95 value of effective neutron multiplication coefficient under the assumed accident situations (including the flooding by water),
   2. the exceeding the 0.98 value of effective neutron multiplication coefficient under the conditions of optimum moderation,
b) to assure the adequate residual heat removal under normal and abnormal operations and under accident conditions,
c) to assure the capability for performance of periodic inspections and tests,
d) to prevent the fall of irradiated fuel during the transport,
e) to reduce to the minimum the possibility of fuel damage, i.e. namely to prevent the exposure of irradiated element or fuel assembly to the non-allowable load during the handling,
f) to prevent the fall of heavy objects on the fuel assembly, i.e. the objects with the mass greater than the mass of fuel assembly,
g) to enable storage of damaged fuel elements or damaged fuel assemblies at the constructions and operational units, the part of which is a nuclear reactor,
h) to assure the radiation protection of nuclear installation personnel,
i) for wet storage with a water charge to assure
   1. the check-up of chemical composition and of radioactivity of all water, inside of which the irradiated fuel is stored or in which there is handling of it,
   2. the monitoring and controlling the height of water level in the spent fuel pool and the leakage detection.“

The RAW generated from SF management shall be minimized by the technology / process of storage. For NPP Dukovany, the residual contamination from decontamination of the packaging surface prior to transport from HVB to ISFSF Dukovany is the only potential source for liquid and solid RAW. The residual contamination may only be released from the packaging surface in ISFSF Dukovany during periodical cask treatment / cleaning where radionuclides may be transported to cleaning solutions, detergents, or the protective aids of the personnel.

In case that SF will be declared by the generator or by the Office as RAW and subsequently disposed in DGR the activity shall be also regulated by the legislation relating to disposal of RAW in the underground (at present Act No. 44/1988 Coll. and Act No. 61/1988 Coll., as amended later).

The relationship between different stages of the SF management were already considered in the Policy (see Chapter 2.2) whereas all key stages of the SF management are defined under the Atomic Act, or its implementing regulations. The activities as currently being implemented cover all stages of the SF management through its storage. SÚRAO was established in 1998 as the state

organization to provide for activities associated with disposal of RAW, i.e. also for activities relating to conditioning of SF into a form suitable for disposal and for activities associated with sitting, construction, commissioning, operation and closure of repository systems.

The protection for individuals, society and environment against radiological hazard associated with the SF management on the territory of the Czech Republic is defined, in particular under the Atomic Act and Decree No. 307/2002 Coll., on the radiation protection. In compliance with the international recommendations and the law of the European Community, this Decree stipulates the exposure limits (general limits, radiation personnel limits and limits for apprentices and students), derived limits and authorized limits of exposure.

Any potential impact on the environment, that is even any biological or chemical hazard possibly related to the SF management, shall also be reviewed and evaluated in the process of review of the plan effect 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 installations designed for processing of spent or irradiated nuclear fuel or highly active radioactive wastes“* as Category I, Number 3.4 (plans subject to review at all times).

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 basic principles of the Policy. While some activities shall be continued even in the remote future such as development, construction and operation of the deep geological repository (DGR), there are prerequisites 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 Installations

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 operation of four VVER 440/213 reactors. These light-water reactors are operated in refueling cycles. Once a year, each reactor unit is shut down for planned refueling outage and equipment review. During the refueling outage, some of the SF assemblies of VVER 440 having worked the required number of cycles are removed from the reactor core to the adjacent SF pool located in the reactor hall (one SF pool pertains to each reactor). The annual generation of SF per reactor unit is approximately 10 t HM. The SF is stored in the SF pools for five years at least to be consequently loaded into the type approved transport and storage cask CASTOR-440/84.

Each VVER 440/213 reactor zone contains total of 349 FAs of which 312 are working assemblies and 37 are control assemblies.

A description of FAs used in VVER 440/213 reactors are provided in the National Report by the Czech Republic under the Joint Convention, Revision 1.1, of February 2003.

7.2.1.1 SF pools

The FAs are stored in SF pool using a compact rack with capacity of 682 FAs. This compact rack with three sections is composed of hexagonal pipes made from the special material ATABOR containing boron. The lower part of each pipe is welded to the support plate while the upper part is welded tight. The entire bundle of pipes is tightened with a flanging frame. The sections are connected to the support plate using pins.

The SF pool also contains total of 17 hermetically sealed cases designed for storage of damaged fuel.

For complete fuel unload from the reactor performed regularly once in four years in order to inspect the reactor pressure vessel and reactor internals, an „auxiliary rack“ with capacity of 350 points may be installed in the SF pool to provide for temporary storage of such removed fuel assemblies.

SF pool is filled with water containing boric acid solution of the min. concentration 12 g/kg. The minimum water level in the pool shall be 14.45 m when fuel is stored in the compact rack or 18.5 m when fuel is stored in the auxiliary rack. These levels provide a sufficient layer of water to catch any possible release of iodine from the damaged fuel assemblies, as well as to protect the personnel against SF radiation.

The decay heat is removed from FA using the cooling system of the SF pool. This system was designed with two stand-alone circuits where each of those was dimensioned for the maximum design heat load under complete fuel unload, that is 8.14 MW (by the type of used fuel, the actual heat load of the SF pool shall not exceed 4 MW even under emergency removal of all fuel from the reactor and the lower storage rack filled with the previously removed fuel). Under normal operation of the system, one circuit is working and the other one is used as stand-by. Removed heat goes through a system exchanger to the cooling circuit of the essential service water.

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.

ISFSF Dukovany basic specifications:

Equipment supplier	GNS/NUKEM Consortium of Alzenau, Germany
Construction start date	06/1994
Construction end date	07/1995
Commissioning	12/1995
Facility length	56 m
Facility width	28 m
Facility height	20 m
Capacity	600 t HM.

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 actual structure 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.

These functions of CASTOR-440/84 casks are provided during transport, storage as well as during design basis accidents.

A CASTOR-440/84 cask consists of a thick-walled cylindrical body with a bottom, provided with a double head closing system in the upper part plus a built-in structure to store a fuel assembly. The radial ribs on the outside of the cask envelope are to extend the heat transfer surface.

Fig. 7.1 ISFSF Dukovany Storage Hall

For the purpose of transport and handling, the cask contains 2 pairs of trunnions and removable shock absorber and for storage a protective plate.

The basic parameters of CASTOR-440/84 cask:

Diameter	2660 mm
Height	4080 mm
Wall thickness	370 mm
Material	cast iron with spheroidal graphite
Loaded cask weight including the protecting shield (exc. shock absorbers)	116 110 kg
Maximum FA heat output	21 kW
Maximum total permitted activity	2.7×10^{17} Bq
Maximum dose rate on the cask surface (the most exposed area)	< 2 mSv/h
Maximum dose rate at the distance of 2 m	< 0.1 mSv/h
Number of fuel assemblies in OS	84 pcs
Maximum initial FA enrichment	3.60 % wt. ^{235}U
Maximum FA burn-up	42 000 MWd/tU
Minimum FA residual heat removal time	60-69 months depending on burnup
Maximum heat output of a single PS	250 W.

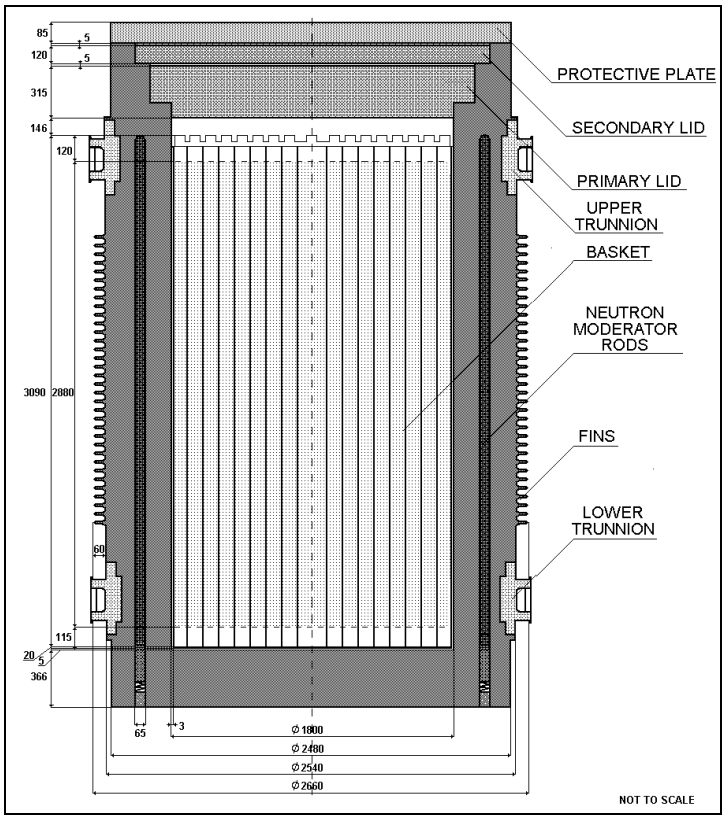

Fig. 7.2 CASTOR-440/84 cask

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.

Characteristics of fuel assemblies of VVANTAGE 6 type are provided in the National Report by the Czech Republic under the Joint Convention, Revision 1.1, of February 2003.

7.2.2.1 SF pool

Fuel unload from the reactor and its consequent storage in the pool are performed under water to provide fuel shielding and cooling as needed. Boric acid is solved into water with the concentration kept at 11.44 g/l. The water charge is cooled using three identical cooling circuits which may be interconnected with each circuit dimensioned to cover by itself with a great margin the normal operating heat load of the entire pool (i.e. less the emergency defined core) which may reach up to 2.83 MW_t. The water level above the fuel stored is automatically maintained at the required level using the charging system. The fuel assemblies removed from the reactor are placed into the compact storage rack in the pool. The design and material of the rack shall maintain subcriticality of the stored fuel.

If there is a cladding leak identified during testing of FAs, or fuel rods, the damaged elements are placed into hermetically sealed cases (enclosures). There is one section of the storage rack reserved for cases. If a compact storage rack is used and the reactor is operated in four-year fuel cycles, the size of the SF pool allows to keep fuel in the main unit buildings as long as 12 years from reactor unload. A rack for one unit comprises total of 705 storage positions of which 678 positions are reserved for undamaged FAs, and 25 positions are reserved for enclosures of damaged FAs, or damaged fuel rods, and 2 positions are used to accommodate cluster cases. One section of the storage rack, 163 nests, is always kept on stand-by for outright and complete core unload.

The compact storage rack of SF pool is designed to store spent, both operated and damaged FAs, clusters and cluster capture. The entire rack consists of five sections, each of which comprises two major parts: support plate and absorber part with storage nests. The nests for undamaged FAs are composed of hexagonal absorber tubes made from ATABOR special stainless steel containing 1% of boron. Both tube ends are welded into steel plates making a fuel alignment plate for nests. This solid weldment lies on pillars of the rack support plate. The support plate bears on the bottom of the pools using depth adjustable supports, which allow accurate horizontal alignment of the plate.

Technical parameters of the rack:

FA nests	678
Enclosure nests	25
Cluster case nests	2
FA spacing	288 mm

Enclosure spacing	400 mm
Absorber tube plate thickness:	4.2 mm
Material	stainless steel ATABOR.

The compact storage rack is classified under seismic resistance Category 1.

SF pool also includes a cover used to cover up the pool under operation of the unit. The major functions of this cover are to prevent foreign objects from falling into the pool, protect the operator against the pool radiation, limit water evaporation from the pool, and restrict the spray system water to fall into the pool. The capacity of the cover is 400 kg/m^2 and its classification is seismic resistance Category I.

A removable gate is used to separate SF pool from ŠTK and the reactor cavity. It is used to rise the level in the space to the transport level. The inside diameter of the opening being closed is 1200 mm and the height 7400 mm. The removable gate comprises of a removable slide gate and a built-in supporting frame. The slide gate is equipped with rubber packing and cam mechanism to seal the slide gate down to the frame. The slide gate is withdrawn or inserted using a polar crane in the reactor hall.

7.2.3 ÚJV Řež a. s.

7.2.3.1 Bldg. 211/7 - SF Storage Facility

By the 31 December, 2004, there were 12 pcs of IRT–2M SF assemblies stored in Pool A with the initial enrichment of 80 % wt. ^{235}U plus 51 pcs of SF elements with the initial enrichment of 36 % wt ^{235}U. When the new HLW storage facility was built providing storage of HLW in drums, most of the old experimental devices were disposed to improve water purity.

The following activities were completed during the past few years:

- purification of the pool water in the SF storage facility – water replacement, filtration, filter modification for corrosion product colloids and filter media replacement,
- disposal of contaminated water and filter media and other RAW,
- cleaning and renovation of FA support stands,
- removal of the deposit from the bottom of pools, and its disposal (method, agents and equipment, implementation),
- monitoring of the conditions in pools using the industrial TV.

Water chemistry has been regularly monitored, including:

- determination of content of Cu, Al, Fe, Cl ions,
- determination of the volume activity of gamma ^{137}Cs and other fission products,
- special techniques have been developed to isolate and determine low concentrations of neptunium, uranium, and plutonium, and their isotope composition in nano or subnanogram amounts,
- determination of uranium or transuranium elements using the techniques in the SF storage facility,

- verification of the method used to identify plutonium in the actual samples, that is reactor water, rinsing water from a leaking fuel element and water in the SF storage facility (different sampling levels or sludge).

The scope of supervision was determined by SÚJB in respect to the identified corrosion and leakage of fuel assemblies.

In 1995 accessible places of both Pool A and B were inspected using an underwater camera. A slight corrosion was identified at those points where the anchoring supports placed in concrete are welded on the outside, however, with no impact on the strength or integrity of the pool.

Once the major part of SF was relocated to the new HLW storage facility, the water was drained from Pool A, FA stands were removed, and the pool was thoroughly cleansed and visually inspected in 2000. The inspection determined a very good condition of the pool walls while a light surface corrosion was identified and removed from some points of the walls. There was no damage identified that might result in water leaks from the pool. Once the inspections were completed and Pool A was cleansed, it was filled with clean demineralized water and it allows to maintain the water quality as prescribed for SF storage by the fuel manufacturer. Based on results of this inspection, SF is only to be stored in Pool A prior to transport to the HLW storage facility while Pool B is reserved for storage of the activated parts of probes and loops and HLW.

7.2.3.2 Bldg. 211/8 - HLW Storage Facility

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

- PS EK–10 ,
- PS IRT–M and IRT–2M,
- RAW
- Surveillance and assessment program for RAW, and
- Solid non-standard waste.

RAW is stored fixed in concrete in barrels of 200 liters within storage boxes (II, IV). The waste from the surveillance program is in metal containers in Box I. The non-standard solid RAW is stored in Boxes III. During the refurbishment of the HLW storage facility the boxes VI – VIII have been e provided with a technology to handle EK-10 type fuel.

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

The basic parameters of IRT–M/IRT–2M FAs are provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1 of February 2003.

FAs IRT–M are covered with a layer of shielding water in the pool (240 pcs in total). FAs EK – 10 are stored dry using special storage units with the final number of 190 pcs and in the wet storage in the pool B (16 pcs.)

7.3 Siting of Proposed Installations

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

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

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

In late 2004 activities were conducted on the Czech Republic's territory associated with prospective siting of a new SF storage facility in Temelín with the capacity of 1370 t HM. Considering the capacity of SF pools at NPP Temelín it is necessary to open the SF storage facility at NPP Temelín in 2014 at the latest.

As a part of the plan preparation a feasibility study was completed in 2002 for siting of a SF storage facility at the NPP Temelín site. Taking into account the favorable experience ČEZ, a. s. gained in NPP Dukovany with the dry storage technology for SF in packagings for transport and storage, the storage technology for SF from NPP Temelín will be similar. It is assumed that the SF will be first stored in SF pools to reduce its decay power and then relocated under water from SF pools to cask located in ŠTK. Full cask will be subsequently dried in the reactor hall, evacuated, filled with helium and hermetically sealed. This will be followed by prescribed dosimetric measurements. Then the cask will be dropped in a transport corridor to a special railway car container. According to the Policy, the expected storage time should be around 60 years.

The preparations for construction of SFSF Temelín follows the Government Decree No. 121/1997 of 5 March, 1997 in which the Czech Government recommended to build SF storage facilities at the sites of the operated NPPs. The advantage of this solution is elimination of SF transport outside the NPP site and utilization of the existing NPP sites without having to intervene into intact landscape. The development of SF storage facility in Temelín also follows

the Czech Government resolution No. 487/2002, which approved the Policy for SF and RAW management (see chapter 2.2).

The following key steps have been taken in connection with the development of SFSF Temelín:

- announcement of the plan to site SFSF on the NPP Temelín site to the Ministery of Environment (July 2003),
- development of EIA documents for SFSF Temelín and submission of them to the Ministery of Environment (July 2004),
- development and submittal for review of documents in agreement with EC recommendation 1999/829/Euratom on implementation of Article 37 of Euratom Treaty (February 2005),
- development of the Initial Safety Report in agreement with the requirements of the Atomic Act in connection with the application for siting license and submission of them to the SONS (February 2005),
- development of EIA documents for SFSF Temelín and submitssion of them to Ministery of Environment (2nd quarter of 2005),
- public discussion on the environmental effects of the SFSF Temelín (24 August 2005).

A comprehensive description and assessment of impacts of the project on population and the environment were completed as a part of EIA documents, in compliance with Act No. 100/2001 Coll., on assessment of impacts on the environment. Input data for the analysis included information about the project and required inputs (soil, water, input materials and energy sources, infrastructure requirements) and outputs (atmospheric pollution, effluents, wastes, etc.). The EIA documents also include a summary of non-technical nature, containing brief basic information about the project and conclusions from individual areas of assessment of impacts on individuals, community and the environment. The documents are available to the general public also on the website of the Czech Republic's Ministry of the Environment.

The EIA documents were mailed to municipalities, local government authorities and administration bodies affected by the planned project and, in agreement with article 4 of the Espoo treaty and Section 13 of Act No. 100/2001 Coll., also to the Austrian party. In conformity with article 5 of the Espoo treaty and section 13 of Act No. 100/2001 Coll., the Austrian party was offered a meeting to discuss the issue, which was accepted and the meeting was held in January 2005.

Implementation of the SFSF Temelín will be provided for in a standard manner. An international tender is expected to be open for the storage technology contractor. If ČEZ, a. s. encounters major obstacles which might threaten timely completion of the SFSF Temelín a back-up site in Skalka is available. The Skalka site is about 160 km from the NPP Temelín site, where ground investigations were performed there in the past, including an exploration gallery (an underground dry container storage for SF had been originally planned there). At the moment a valid planning permit is available, however no construction or other activities are under way on the site, just guarding, public and institutional excursions and observation of long term geologic parameters.

7.4 Installation Design and Construction

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

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

(iii) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

At present only one SF management installation is under construction in the Czech Republic - SFSF Dukovany at the NPP Dukovany site with the capacity 1340 t HM. Due to the limited capacity of the existing ISFSF Dukovany the facility shall be in operation by 2006. The storage capacity of SFSF Dukovany will be sufficient for all SF from NPP Dukovany once the operated ISFSF Dukovany is full and until decommissioning of all the four units of NPP Dukovany.

The safety for stored SF in the planned SFSF Dukovany is based on the properties of dual-purpose casks the structure of which meets all of the safety criteria. SFSF Dukovany will only be used for the casks with a B(U) or S type approval for cask in accordance with the Atomic Act, or the successive SÚJB Decree No. 317/2002 Coll. The CASTOR-440/84M cask supplied by the GNS Essen company will be used for the initial operation of SFSF Dukovany.

The SFSF building, including the shielding concrete wall provides an additional protective function. The ALARA principles were applied to the design of OS, as well as to the building of SFSF Dukovany.

The following key steps have been made in connection with the construction of SFSF Dukovany:

- development of EIA documents for SFSF Dukovany,
- development of an expert opinion for EIA documents for SFSF Dukovany,
- public discussion of environmental impacts of SFSF Dukovany,
- issue of a favorable position by MŽP ČR,
- development of the Initial Safety Report in connection with the application for a siting license,
- issue of a siting license by SÚJB for the SFSF Dukovany at the NPP Dukovany site,
- issue of a planning permit,
- selection of a designer for SFSF Dukovany,
- selection of cask supplier for initial operation of SFSF Dukovany,
- development of a Preliminary Safety Report in connection with the application for a license for construction of SFSF Dukovany,
- issue of a license by SÚJB to construct SFSF Dukovany in the NPP Dukovany site,
- start of construction of SFSF Dukovany (April 2004).

Fig. 7.3 The ISFSF Dukovany (left) and SFSF Dukovany under construction (right)

More detailed information about the Preliminary Safety Report for the SFSF Dukovany is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003.

The basic SFSF data:

Construction title	Spent Fuel Storage Facility
Construction site	Dukovany
Region	Vysočina (Czech Highlands)
Investor	ČEZ, a. s.
Cask supplier for initial SFSF operation	GNS Essen
Construction supplier	HOCHTIEF VSB, a. s.
Designer	ÚJV Řež a.s., Division Energoprojekt Praha, a. s.
Estimated start date	12/2002
Estimated end date	03/2006.

7.4.1 Personal Exposure Evaluation for SFSF Operation

The evaluation of personal exposure is based on the estimated effective doses from external whole-body exposure of the persons involved in the operation of the storage facility. In order to determine the estimated effective doses, the employees were divided into groups by the nature of their work / performed activity. The number of personnel, as well as demanded time, is based on the design documentation of the SFSF process part. Results of the analysis show that the annual effective dose per person varies between 0.5 – 11 mSv depending on the nature of their work / activity, and the collective dose is estimated around 80 mSv which provides a sufficient margin to ensure, even with a level of uncertainty relevant to the current knowledge, that the guidance value of 1 Sv set for the annual collective effective dose shall not be exceeded.

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

The selected process of dry storage implies that external exposure may be the only potential route of exposure for the environment or the population. The shielding concrete wall around the storage area of SFSF is designed as the radiation shield. The wall thickness of 50 cm was selected as the optimizing method to make sure that the dose rate equivalent is less than 2.5 μSv/h.

Due to the fact that dose rate is rapidly dropping with distance from the source, a sufficiently conservative estimate may envisage the effective dose rate from the storage facility to be about 10^{-9} Sv/h or less in any other area of the NPP site. This estimate was based on the drop of the photon and neutron radiation flow with distance from its source. It implies that the effective dose contribution of the storage facility for any person working on the site or within its protection zone will be less than 2 μSv/y, and the effective dose rate contribution of the storage facility on the fence of NPP will be considerably less than 100 μSv/y.

For the critical group of population represented by citizens of the nearest municipalities about 3 km away from the considered source, the effective dose rate estimate may be at the level about 10^{-17} Sv/h, and the resulting effective dose about 10^{-13} Sv/y It is evident that the dose rate contribution of the storage facility as a source of ionizing radiation is well insignificant and much lower than the contribution of natural sources, as well as considerably lower than the regulatory limits and guidance values of exposure.

7.4.3 Radiation Monitoring

SFSF Dukovany is a NI by wording of the Act No. 18/1997 Coll. The scope and method used for radiation monitoring of SFSF Dukovany is such that all obligations imposed on the holder of license for utilization of a nuclear installation are met.

The design of radiation monitoring shall cover the following:

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

The radiation monitoring system will be similar to the existing ISFSF Dukovany. Additionally to the above system, SFSF Dukovany is planning to use the so called radiation monitors of the airstreams from the cask drying system in the reactor units aimed to control FA leak tightness in the course of cask drying, and also monitoring of the released airstreams in terms of radiation. The airstream radiation monitor will be used to detect noble gases (^{85}Kr) and aerosols (^{134}Cs, ^{137}Cs, ^{144}Ce, ^{139}Ce, ^{106}Ru, ^{60}Co, ^{58}Co, ^{54}Mn, ^{110m} Ag) in the airstream.

The existing environmental radiation monitoring system of NPP Dukovany providing for monitoring of all components of the environment shall be used in full scope to monitor the ambient environment. The construction of SFSF Dukovany will not affect the scope and number of the environmental radiation measurements outside of NPP Dukovany. On the site, SFSF

Dukovany may only affect the number or location of environmental sampling points during construction and during SFSF operation.

7.4.4 Emergency preparedness

Any emergency situation in the planned SFSF Dukovany shall be dealt with using the emergency preparedness system of NPP Dukovany which is described in detail in the National Report of the Czech Republic under the Convention on Nuclear Safety, Chapter 11, prepared in September 2001, or in Chapter 6.5 of this Report.

7.4.5 Safe Decommissioning

In accordance with the Atomic Act, a draft concept for safe decommissioning, including RAW disposal, shall be part of the licensing documentation for construction of SFSF Dukovany. The method and scope of decommission are set forth in the implementing Decree No. 185/2003 Coll., on decommissioning of nuclear installations and workplaces in categories III or IV.

The SF shall be kept safe in SFSF Dukovany until classified as RAW in compliance with the Atomic Act. Then it shall be forwarded to SÚRAO for safe disposal in compliance with the Policy in force.

The decommissioning concept of SFSF Dukovany is strongly affected by the selected fuel storage technique. SFSF Dukovany is a surface storage facility with dry storage using casks, where the major function in SF storage is performed by the cask itself. It is a highly safe storage technique with minimum generation of operating wastes of which the majority shows radioactivity values permissible to be discharged into the environment.

The decommissioning of SFSF Dukovany shall be preceded by removal of all SF casks from the storage facility, and clearance of the operating, liquid, or solid wastes, including radioactive, hazardous, or toxic wastes, and elimination of any identified contamination on the technological or construction surfaces, and providing the documents required to revoke the controlled area and the radiation monitoring system, and providing the data as necessary to amend the emergency plan and physical protection on the site of NPP Dukovany. No contaminated material, or contaminated equipment, or contaminated civil structure shall remain in the storage facility after decommissioning of SFSF Dukovany.

No decontamination work is envisaged for the decommissioning process of SFSF Dukovany. RAW generation is not anticipated due to the above described concept of decommissioning. No dismantling or demolition work is envisaged since the storage building is planned to be used for storage and handling needed for decommissioning of NPP Dukovany.

The essential decommissioning activities for SFSF Dukovany shall include control radiation monitoring, updates of the existing documentation, and preparation of the documentation needed for exclusion of the construction from the scope of the Atomic Act. The decommissioning shall encompass the final measurements and radiation assessment of the overall SFSF site to be used as the basis for evidence that the level of surface contamination on any parts of SFSF Dukovany is

kept within the limits prescribed for unlimited use or, if applicable, for unlimited discharge into the environment of materials defined under the implementing regulation of SÚJB.

7.5 Assessment of Safety of Facilities

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

(i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

7.5.1 Nuclear Power Plant Dukovany

7.5.1.1 SF Pools

The SF pools in the main production building are partial technological units within these operating units and therefore their safety has not been analyzed separately but as part of safety reports for the reactor units.

In NPP Dukovany safety reports have been developed separately for reactor units (which also include SF pools) and ISFSF Dukovany.

Based on a resolution by ČSKAE No. 154/1991 and other SÚJB requirements and general international recommendations a safety report was elaborated for EDU in 1994, which in a comprehensive manner documented the satisfactory status of nuclear safety assurance at EDU production units. The report is called Operational Safety Report for EDU Unit 1 and is based on the original Pre-operational Safety Report for EDU and its numerous amendments. The safety report structure follows, based on a SÚJB recommendation, the document "Typical content of technical substantiation of safety - safety report - nuclear power plants", published in “Safety of Nuclear Installations No. 5/1988”. Based on the documents SÚJB issued its Decision No. 197/95 (license to operate Unit 1 after ten years) on 21 August 1995

Subsequently, other parts of the Operational Safety Report were developed, specific for Units 2, 3 and 4 at EDU, and reviewed by SÚJB to issue licenses for their operation. Considering the terminology used in the new Czech legislation the Operational Safety Report was, on SÚJB request, in 1998 renamed and as part of regular updating submitted to SÚJB identified as Pre-operational Safety Report for EDU, Revision 1.

At the moment works have been under way to modify the safety report in agreement with US NRC RG1.70, which is now an internationally recognized standard for safety reports. The safety report will serve as an input document to grant another 10-years license to operate EDU reactor units after 2005.

A brief summary of extraordinary events in SF pools, as evaluated by EDU safety documents, is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003.

7.5.1.2 ISFSF Dukovany

The Pre-operational Safety Report, Revision No. 1 from July 1995, was one of the main supporting documents for SÚJB approval for trial operation of ISFSF Dukovany. The approval was provided in the SÚJB Resolution No. 245/95 of 24 November 1995.

Revision No. 2 of the above-mentioned report followed in September 1996; it was reviewed, including other necessary documents, and SÚJB issued Resolution No. 29/97 of 23 January 1997 permitting permanent operation of ISFSF Dukovany.

At the moment, Revision No. 3 has been in effect for ISFSF Dukovany of the Pre-operational Safety Report from January 2000, which was one of the supporting documents to issue the SÚJB resolution permitting to extend the operation of ISFSF Dukovany until 31 December 2010.

7.5.2 Nuclear Power Plant Temelín

Identically as in case of NPP Dukovany the SF pools are part of the main production building and therefore their safety has been evaluated within the safety documents for the entire NPP Temelín.

A brief summary of analyses, developed as a part of the Pre-operational Safety Report for NPP Temelín in connection with the operation of SF pool, is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003.

7.5.3 ÚJV Řež a. s.

7.5.3.1 Building 211/7 - SF Storage Facility

The safety evaluation has been performed in the Pre-operational Safety report for LVR – 15 reactor, Reg. No. ÚJV 11783 T of June 2002. The wet accumulator tank and pool A in the facility has been used to store irradiated fuel for the decay period, before it is moved into the high-level waste storage facility. Both in the accumulator tank and pool A the fuel assemblies are placed in a storage grid which assures undercriticality of the system. The storage environment of the fuel assemblies is demineralized water with the same parameters as prescribed for the primary circuit.

The capacities and grid spacings are as follows:

- Wet accumulator tank for SF
  storage capacity 60 units
  grid spacing 150 x 150 mm
- pool A in the facility
  storage capacity 80 units
  grid spacing 150 x 150 mm

(neighboring units are separated with 0,5 mm thick cadmium plates).

If SF is in the reactor the wet accumulator tank shall have a sufficient number of free units to accommodate the fuel in case of an accident.

For handling and storage of irradiated fuel the requirements specified in Section 47 of Decree 195/1999 Coll. have been met as follows:

- undercriticality is assured by placement of fuel assemblies in stable stands with grid spacing which provides for sufficient undercriticality,
- removal of residual heat in the storage facility is assured with a large volume of water in the pool A and the minimum period of 2 years between the fuel removal from the reactor and transport into a storage facility. Sufficient cooling of fuel assemblies is documented with operational measurements throughout the operation of VVR–S reactor and subsequently, after the reconstruction, of LVR–15 reactor. An auxiliary cooling circuit has been installed in the wet accumulator tank for transport of a big number of irradiated FA from the reactor. The big number means that more than four fuel assemblies need replacement or a handling needs to be performed in the core which requires to evacuate a part of the core,
- aids to handle packagings for fuel transport are regularly inspected before any transport of fuel assemblies. The crane in the reactor hall is regularly inspected in agreement with regulations for lifting equipment. The inspection of the wet accumulator tank was performed in 1996; the inspection of pool A in the facility was performed in 2000,
- to prevent a fall of SF during transport and to reduce its possible damage during handling the workers strictly follow the Program for transport, storage and handling of fuel for the LVR–15 reactor,
- wet accumulator tank and pool A in the storage facility are provided with lids,
- leaking fuel assemblies are stored in hermetic cases in wet accumulator tank and in the pools in the storage facility,
- radiation protection during SF handling is assured through the radiation protection system for the LVR–15 reactor workplace,
- chemical composition of water and water radioactivity in the storage tanks is checked 1x month. The water level in the wet accumulator tank is measured and transmitted into the reactor operators' room, the water level in the storage facility pools is checked once in 14 days. The water is made up into the tanks via pipes from demineralized water supply tanks on the 2nd gallery in the reactor hall.

7.5.3.2 Building 211/8 - HLW Storage Facility

7.5.3.2.1 HLW Storage Tank

Undercriticality of the HLW storage tank for SF has been verified by a calculation using MCNP 4C program and a set of libraries with effective cross-sections DLC–200 dedicated to the program. The individual calculations anticipate that free space in the tank is evenly filled with water of various density. The HLW storage tank meets the requirement for the system undercriticality. For the tank flooded with water $k_{eff} = 0.459 \pm 0.016$. For the tank in a condition of optimum moderation $k_{eff} = 0.737 \pm 0.017$.

The heat output of the stored SF has been established for storage of SF in the tank B in the high-level waste storage facility, under a layer of shielding water. The overall heat output of the stored SF has been established based on the following conditions and assumptions:

- The output has been established for full utilization of the tank's storage capacity,
- Generated residual heat for each stored fuel assembly has been calculated by the ORIGEN program, version 2.1, for the following anticipated parameters:
  - Fuel IRT – 2M, 4-tube FA, enrichment 36 % wt. ^{235}U, burnup rate 60 % (180 MWd/kg),
  - Fuel IRT – 2M, 4-tube FA, enrichment 80 % wt. ^{235}U, burnup rate 55 % (350 MWd/kg),
  - Fuel EK 10, enrichment 10 % wt. ^{235}U, burnup 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 $k_{eff} = 0.06195$ for the basket and $k_{eff} = 0.06776 – 0.07159$ 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.

7.6 Operation of Facilities

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

(i) the license to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning program demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;

(v) incidents significant to safety are reported in a timely manner by the holder of the license to the regulatory body;

(vi) programs to collect and analyze relevant operating experience are established and that the results are acted upon, where appropriate;

(vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.

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. Safety evaluation for EDU reactor units has been in detail described in the National Report by the Czech Republic under the Convention on Nuclear Safety, elaborated in September 2004.

To complete the information, it should be mentioned that 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.

As on 31 December 2004 ISFSF Dukovany contained 4536 SF assemblies in 54 CASTOR-440/84 casks. The numbers of stored casks with FAs since 1995 are shown in Fig. 7.1.

The increased number of stored casks in 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.

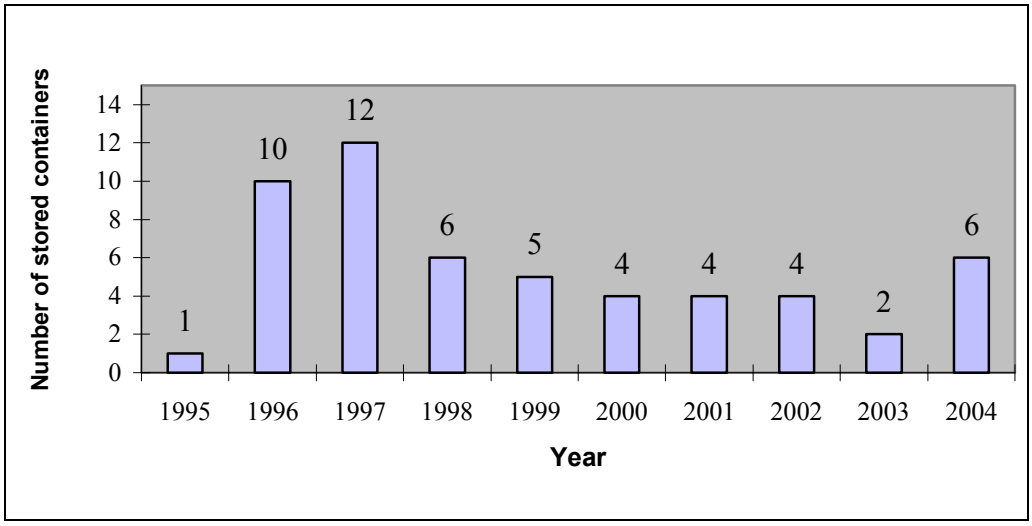

Diagram 7.1 Numbers of stored packagings kept in ISFSF Dukovany

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 limits and conditions for operation of ISFSF Dukovany, also approved by SÚJB.

The limits and conditions for operation of ISFSF Dukovany deal with the following:

- 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).

7.6.1.2.1 Monitoring, Inspections, Tests and Maintenance at ISFSF Dukovany

Radiation Monitoring

The radiation monitoring system is designed to monitor the radiation situation in the interior of ISFSF Dukovany and its surroundings, in order to regulate presence of persons in the environment with ionizing radiation and to document the minimum impact of the selected storage technology on the personnel, population and the environment.

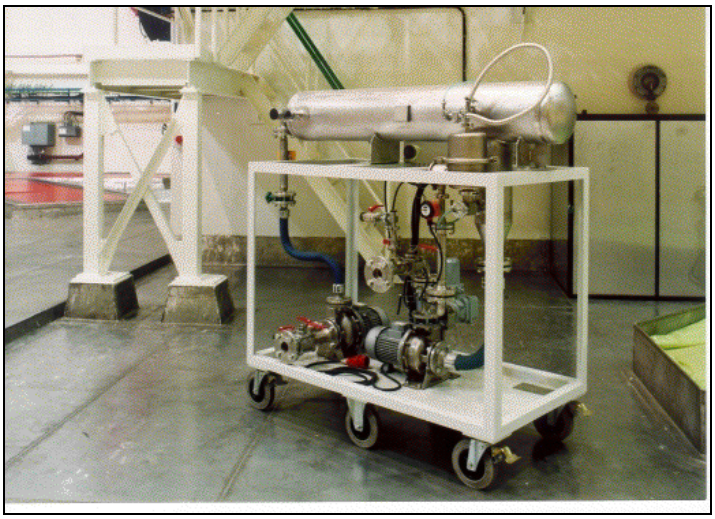

Fig. 7.4 Equipment for re-flooding of CASTOR-440/84 casks

The radiation monitoring system in the ISFSF Dukovany building includes:

- monitoring of gamma radiation dose rate,
- monitoring of neutron equivalent dose rate,
- monitoring of volume activity of gases and aerosols,
- monitoring of contamination of the working environment and items,
- monitoring of contamination of persons.

The radiation monitoring system in the surroundings of ISFSF Dukovany includes:

- monitoring of gamma radiation dose rate,
- monitoring of underground water activity.

The system is classified as a subsystem of the radiation monitoring system of NPP Dukovany. The monitoring data about dose rate and volume activity of gases in ISFSF Dukovany, as well as the monitoring data about pressure between the primary and secondary lids of the packagings, are displayed in the radiation monitoring central control room, where the parameters are continually checked.

System measuring pressure between the packaging lids

The purpose of the system is to provide local and remote, i.e. in the central radiation monitoring control room, information about the helium pressure in the space between two lids of each packaging. The data are used to determine tightness of the packagings and to adopt necessary measures.

The following signaling levels are set up in the pressure-measuring system:

- warning level 0,45 MPa,
- action level 0,35 MPa.

System measuring temperature on the packaging surface

Each packaging stored in the storage hall is provided with a temperature sensor and the cask is connected to a monitoring system.

The following signaling levels are set up in the temperature-measuring system:

- warning level 85°C,
- action level 100°C.

Periodic inspections of pressure sensors in the packagings

According to the Metrology Act and related regulations the helium pressure sensor between two lids of the cask is considered a working measuring device. Such a working device, in agreement with the metrology rules of NPP Dukovany, shall be subject to periodic inspections. The inspection period for pressure sensors on casks has been established at 6 years.

Fig. 7.5 A periodic inspection of a pressure sensor

Periodic inspections of trunnions on the cask

Periodic inspections of trunnions on the cask are performed every 3 years.

Periodic inspections of trunnions' bolts on the cask

Periodic inspections of pressure sensors on the packagings include inspections of trunnions' bolts every 6 years to check their potential corrosion. In agreement with a standard technological procedure TTČ-2003/01 the bolts are dismounted, inspected, cleaned and, if applicable, replaced and the trunnions are load tested.

Other inspections and maintenance at ISFSF Dukovany

Other inspection and maintenance at ISFSF Dukovany are performed in agreement with the operating procedure P181j.

7.6.1.2.2 Waste Management at ISFSF Dukovany

Neither normal operation nor conditions of design accidents will result in generation of RAW at ISFSF Dukovany. This is due to the selected technology for SF storage.

The overall annual production of waste is around 150 kg. The waste may be removed from ISFSF Dukovany only after an inspection measurement of contamination and approval of the radiation monitoring personnel. The waste is disposed in agreement with Act No. 185/2001 Coll., on wastes, as amended.

About 5 m^3 of liquid waste is generated every year from washing the floors and packagings in ISFSF Dukovany; the waste is stored in wastewater tanks with the volume 1.9 m^3. A sample is collected from each filled tank, measured by gamma spectrometry and the tank is either discharged into the sewerage system or moved into the reactor building to be discharged into a special drainage system, i.e. to be treated and discharged under control to dispose active residues in RAW Repository Dukovany.

7.6.1.2.3 Engineering and Technical Support of ISFSF Dukovany Operation

Technical and personnel sources of NPP Dukovany have been used to support operation of ISFSF Dukovany. This is one of the major advantages of the selected location of ISFSF Dukovany. As part of contracted technical support for NPP provided by research organizations, also some other tasks are addressed, associated with the operation of ISFSF Dukovany. A substantial part of the research efforts focuses on behavior of SF in the course of long-term storage and other works are planned investigating e.g. behavior of components of the stored casks.

7.6.1.2.4 Monitoring and Evaluation of Events during ISFSF Dukovany Operation

In agreement with legislative requirements NPP Dukovany has a developed system for investigation of operational events and also a system for sharing external operational experience. The systems apply both to the operation of reactors units and ISFSF Dukovany.

The system for investigation of operational events is specified in the EDU internal procedures.

Three types of operational events have been monitored in NPP Dukovany:

- safety relevant (important) events classified under the international INES scale ≥ 0,
- minor events classified outside the INES scale,
- events without consequences – identified before a potential failure, events in this category may be evaluated under INES either beyond the scale or by INES ≥ 0.

The procedure to analyze causes (direct and root causes) of the events is selected from a set of techniques used for analyses, e.g. methodology ASSET, HPES, barrier analysis, change analysis, flow chart of the course and causes of the event, etc.

In agreement with SÚJB requirements, EDU provides information by the agreed date to a SÚJB representative on all events rated under INES ≥ 0 and also on the adopted corrective measures. By discussing the events with SÚJB EDU meets the requirements specified in the Atomic Act. The SÚJB representative on the site also receives a list of all operational events every month.

The reliability and safety of ISFSF Dukovany is documented by the fact that throughout its entire operation since 1995 no event has occurred classified under the international INES scale.

To improve safety and reliability of NPP Dukovany, including ISFSF Dukovany, operational experience from other nuclear installations worldwide has been analyzed and used. The power plant in Dukovany has been an active member of international organizations, which associate operators of nuclear power plants from all over the world, and directly cooperates with several nuclear power plants in Europe. The sharing of experience takes place through this membership in organizations and contacts with other power plants. The process is described in the EDU internal procedure No. 09/107.

7.6.1.2.5 Regular Evaluations of ISFSF Dukovany Operation

Supervision activities by SÚJB in 2004 included two planned inspections of ISFSF Dukovany. In agreement with the limits and conditions for safe operation of ISFSF Dukovany the operator continually monitors basic physical parameters, such as pressure between the primary and secondary lid of each CASTOR 440/84 cask, dose equivalent rate in connection with the mapping of the radiation situation in ISFSF and its surroundings and, in excess to the standard approved limits and conditions, also the surface temperature of all stored casks. The measured values were in compliance with the limits and conditions approved by SÚJB for permanent operation of ISFSF Dukovany. In addition to the monitored physical parameters, also the condition of supporting pin clamping screws has been monitored since 2004 in order to ensure long-term safe manipulation with cask throughout the entire planned storage time.

In connection with a SÚJB requirement NPP Dukovany once a year on a regular basis elaborates a report on operation of ISFSF Dukovany, which is submitted to SÚJB. The report is a summary evaluation of the operation of ISFSF Dukovany in the past calendar year, including an overview of SÚJB supervision activities and their results.

The structure of the evaluation report about the operation of ISFSF Dukovany is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003.

7.6.1.2.6 Concept for Decommissioning of ISFSF Dukovany

The concept for decommissioning of ISFSF Dukovany is the same as for the SFSF Dukovany (see chapter 7.4.5).

7.6.2 Nuclear Power Plant Temelín

Identically as in NPP Dukovany the SF pools in NPP Temelín are partial process facilities of the 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 SF pools is subject to the operating procedure 1(2)T045 „Cooling system for SF pool“. The operation of SF pools is also subject to limits and conditions for safe operation as provided in TL001 (chapter A.3.9), which in respect to SF pool establish requirements for:

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

7.6.3 ÚJV Řež a. s.

7.6.3.1 Building 211/7 – SF Storage Facility

The storage facility is a part of the LVR-15 reactor and therefore it does not have a separate license for the operation.

For activities with a significant impact on nuclear safety and for activities important from the viewpoint of radiation protection written programs and working procedures have been developed. The documents have been elaborated in form of organizational procedures of ÚJV Řež a. s., as working procedures for the LVR-15 reactor workplace. Their list is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003.

7.6.3.2 Building 211/8 – HLW Storage Facility

A detailed overview of working and technological procedures associated with the operation of the high-level waste storage facility is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003. Additionally, as a part of the licensing process for reconstructions or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness of nuclear installations and workplaces in category III or IV, in respect to the high-level waste storage facility building 211/8, in ÚJV Řež a. s., documents were submitted to SÚJB including the following:

- Limits and conditions for operation of the HLW storage facility in the course of hot cell construction, Edition No. 4, Revision No. 0, Cat. No.: 3.9.7-3.1/HLW, 29 September 2003
- Limits and conditions for operation of the HLW storage facility with the hot cell in operation, Edition No. 5, Revision No. 0, Cat. No.: 3.9.7.-3.2/HLW, 29 September 2003
- Monitoring program for operation of the HLW storage facility, Edition No. 4, Revision No. 0, Cat. No.: 2.3.2.1-3/300, 1 October 2003
- Definition of the controlled area for operation of the HLW storage facility, Edition No. 4, Revision No. 0, Cat. No.: 2.3.4 -3/300, 1 October 2003
- Proposed method of decommissioning of the refurbished HLW storage facility (Building 211/8), Edition No. 1, Revision No. 0, Cat. No. 3.9.8-3/HLW, 29 August 2003
- Quality assurance program, Implementation of refurbishment of the high-level waste storage facility – building 211/8, Edition No. 1, Revision No. 0, Cat. No.: 4.2.43/315, 24 July 2003
- List of selected equipment, Implementation of refurbishment of the high-level waste storage facility – building 211/8, Edition No. 1, Revision No. 1, Cat. No.: 4.4.2/315, 1 September 2003
- On-site emergency plan for operation of the HLW storage facility, Edition No. 2, Revision No. 0, Cat. No.: 3.9.1-3/300, 1 July 2003

- Plan of inspections and tests, Implementation of refurbishment of the HLW storage facility – building 211/8, Edition No. 1, Revision No. 0, Cat. No. 4.10.88/306, 1 September 2003
- Execution of non-standard activities in the building 211/8 (HLW storage facility), Construction HK-EK-10, Edition No. 1, Cat. No. 2.3.2.1/HLW/1, 18 September 2003
- Estimate of costs for decommissioning of the refurbished HLW storage facility (building 211/8), Edition No. 1, Revision No. 0, Cat. No.: 3.9.8-3/HLW, 29 August 2003, audited by the Administration of Radioactive Wastes Repositories
- Quality assurance program, Manufacture and installation of storage safe for chamber EK-10, Edition No. 1, Revision No. 0, Reg. No. DRS 1165/2003, Cat. No.: 4.2-1/805, 1 October 2003

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 for the facility operation, includes

- monitoring of workplaces with ionizing radiation sources,
- personnel monitoring,
- monitoring of discharges,
- monitoring of the storage facility surroundings

Monitoring in the pool B

In order to ensure shielding of fuel assemblies stored in the pool B in the HLW storage facility and in order to ensure radiation protection of the personnel, the shielding water level and its volume activity are continually monitored in agreement with the limits and conditions for operation of the facility and with the program of operating inspections. Moreover, in order to minimize corrosion of the fuel assemblies, pool, circulation system and water purification system, additional parameters are monitored, such as specific conductivity of water, water pH and temperature and concentration of Cl, Al, Fe and Cu ions.

Monitoring of the MIX 1000 demineralization station

In order to ensure the required quality of the shielding water some parameters of the MIX 1000 demineralization station are monitored, particularly the maximum conductivity at the station outlet, and the 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 wastes 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

As a part of its supervisory activities SÚJB completed one inspection of the facility in 2004, focused on observation of the limits and conditions for safe operation during construction of the hot cell and documents recording the course of the reconstruction.

Once a year the operator of the HLW storage facility submits to SÚJB an evaluation of observation of applicable limits and conditions. The documents deal with the compliance with:

- selected limits and conditions for operation of the high-level waste storage facility – parameters of the shielding water in the pool B and output from the demineralization station,
- quality limits for the shielding water in the pool B,
- temperature limits in the facility,
- limits for air volume activity, and
- limit conditions for dose rates on the surface of columns in the demineralization station.

The document also includes an overview of the demineralization station operation during the whole calendar year and a summary of shielding water quality in the pool B.

7.6.3.2.4 Concept for Decommissioning of HLW Storage Facility

The proposed method of decommissioning of the HLW storage facility is a part of documents to obtain a license for operation of a nuclear installation, pursuant to the Appendix to Act No. 18/1997 Coll., item D, letter b), paragraph 9. Methods and procedures of decommissioning are specified in Decree No. 185/2003 Coll. (its draft was developed in 2001 using the preceding Decree No. 196/1999 Coll.).

The storage facility has been in operation since 1995 and its service life has been planned for 50 years. The decommissioning should therefore occur approximately in 2045. It is anticipated that the decommissioning will be a one-off dismounting and that it will be possible to use the storage building for other purposes.

Decommissioning of the HLW storage facility will be preceded by removal of all radioactive waste, SF and surveillance program samples. Subsequently, the cooling water and ion exchangers will be removed and treated, radiation situation in the storage will be monitored, surfaces decontaminated, piping, valves and technological equipment dismounted, RAW will be fragmented and decontaminated, treated and disposed. The last step will be removal of non-contaminated water and contaminated waste below the limits for discharge into the environment. It is expected that the decommissioning of the facility will produce ca. 15 drums for disposal, 200 l each.

7.7 Disposal of SF

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

The Czech Republic anticipates development of a deep repository in granitic rock formations after 2065. Based on earlier geologic data ca. 30 potential locations have been identified in the

Czech Republic. The repository is expected to accommodate all RAW that cannot be disposed in near-surface repositories, SF classified as RAW and alternatively also HLW from potential reprocessing of SF from EDU and ETE, or SF and HLW from other potential nuclear sources. The overall amount of SF from four units of NPP Dukovany will be 1940 t HM and from two units of NPP Temelín 1370 t HM as a result of the planned period of operation of all the units.

In 1998 – 1999 another alternative for SF disposal was considered in non-dismounted condition and non-shielded casks within the program „Reference project of surface and underground systems in deep repositories in the host environment of granitic rock formations in the agreed structure of the initial design and to the depth of design study“. According to the project, the disposal casks should be surrounded by a bentonite layer and vertically placed in tunnels on a granite massif, about 500 m under the surface part of the DGR.

On 17 – 21 May 2004 SÚRAO hosted in his headquarters in Prague a WATRP mission (Waste Management Assessment and Technical Review Program) which sought to assist the Czech Republic and to provide engineering opinions and comprehensive assessment of deep repository development. At present the main efforts in respect to deep repository development focus on selection of a suitable location, i.e. reduction of the number of six locations selected for future investigation in the Czech Republic. More studies of the project and engineering barriers have been under way, based on generic designs of deep repositories (i.e. designs not specific for a particular location), some optimization studies have been completed and research of materials to be used as engineering barriers has started. Safety studies focus on development of model tools/processes and demonstration of general safety of deep repositories (i.e. completion of a safety analysis and studying of natural analogs). Additional activities include project management, i.e. planning, budgeting, quality management, involvement of the general public, gathering of information and international cooperation. Recommendations provided by the mission will be taken into account by SÚRAO when planning and performing further activities in DGR development. A detailed report on conclusions made by the WATRP mission has been published on the SÚRAO website.

When performing ground investigations in connection with potential DGR development mayors and population of the concerned municipalities showed strong opposition against potential development of DGR. For this reason MPO and SÚRAO reached an agreement approved by the government and the ground investigations in the locations will not continue until 2009.

8. Safe RAW Management – Articles 11 - 17 of the Joint Convention

8.1 General Safety Requirements

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

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

The Atomic Act in Section 24 paragraph 1 requires any person managing RAW to take into account all their physical, chemical and biological properties that might affect safety of the waste management. The requirement is worded in a more detailed manner in Section 46 paragraph 3 of Decree No. 307/2002 Coll. as follows: „*in radioactive waste management in addition to radioactivity, all the other hazardous properties shall be taken into account which might influence the safe waste management, particularly toxicity, flammability, explosiveness, spontaneous fissionability, formation of critical mass or residual heat.*“ These hazardous properties are in RAW management addressed in agreement with general legal regulations on waste management.

Also Decree No. 195/1999 Coll. in Section 47 defines requirements to assure undercriticality and heat removal. *„The installation for the handling with the irradiated and spent nuclear fuel and its storage, and for the handling and storing the other substances containing the fissile products and radioactive substances shall be designed in a such way, in order that it may be possible to prevent with margin the achievement of criticality even under conditions of the most effective deceleration of neutrons (optimum moderation) by area arrangement or by other physical means*

and procedures, and by this to prevent the exceeding the 0.95 value of effective neutron multiplication coefficient under the assumed accident situations (including the flooding by water), the exceeding the 0.98 value of effective neutron multiplication coefficient under the conditions of optimum moderation and to assure the adequate residual heat removal under normal and abnormal operations and under accident conditions."

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. 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., on radiation protection. This is documented by the requirements in Section 46 paragraph 2 of Decree No. 307/2002 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 a 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., 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

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

(i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;

(ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.

8.2.1 Nuclear Power Plant Dukovany

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

Subsequently, the safety of all facilities for RAW management was re-assessed in agreement with the safety requirements for these facilities specified in the Atomic Act and its implementing regulations. Based on this assessment SÚJB issued for EDU a license for RAW management under Section 9 paragraph 1 letter j) of the 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.

HVB I and II each have a treatment plant for SF pool water SVO 4, which provides for discharge, making up and treatment of water from the reactor well and SF pool water and for treatment of water from emergency supply tank of boric acid in HVB. Water from boric acid sewers in HVB

and BAPP is treated separately in the boric acid treatment station SVO 6 (evaporation technology and final treatment of boric condensate and filter condensate on ion exchangers) and after treatment it is recycled at NPP – regeneration of the boric acid reduces the quantity of produced liquid RAW and thus also demand for disposal. Separation of under-limit water containing chemicals reduces the quantity of produced RAW and also the quantity of waste to be disposed. Low-activity water from a special laundry and hygienic closures is after radiochemical inspection discharged into NPP wastewater sewerage. If the water fails to meet the conditions for discharge it is treated jointly with wastewater from HVB at SVO 3. Steam generator blowdown is treated on the ion exchanger filtration station SVO 5 which provides for qualitative parameters of water in the secondary circuit.

The wastewater treatment plant SVO 3 is used to treat water from special sewerage and water from washing and regeneration of filtration lines of the individual treatment plants in HVB and BAPP. The water is accumulated in wastewater tanks and further run to evaporators in SVO 3, where the water is concentrated to ca. 200 g/l of salts and the concentrate is kept in tanks with liquid RAW. A part of the condensate is further treated on a mechanical filter and on ion exchangers at SVO 3 and recycled at EDU. Tanks with the concentrate are used to store concentrated RAW before further processing (bituminization).

- 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 wastes which meet criteria specified in Decree No. 307/2002 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 gathering, storage and processing of solid RAW.

The system for treatment of liquid radioactive media 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.

A treatment plant for SF pool water SVO 4 is situated in BPP, which provides for discharge, making up and treatment of water from the reactor well and SF pool water and for treatment of water from emergency supply tank of boric acid in HVB. Water from boric acid sewers in HVB and BAPP is treated separately in the boric acid treatment station SVO 6 (evaporation technology and final treatment of boric condensate and filter condensate on ion exchangers) and after treatment it is recycled at NPP. Regeneration of the boric acid reduces the quantity of produced liquid RAW and thus also demands for disposal.

Separation of under-limit water containing chemicals reduces the quantity of produced RAW and also the quantity of waste to be disposed. Low-activity water from a special laundry and hygienic closures is processed in a centrifuge in a regime separate from radioactive water – dry matter is filled into plastic bags and put into casks; separated water is after radiochemical inspection discharged into NPP wastewater sewerage. Steam generator blowdown is treated on the ion exchanger filtration station SVO 5 which provides for qualitative parameters of water in the secondary circuit.

The wastewater treatment plant SVO 3 is used to treat water from special sewerage and water from washing and regeneration of filtration lines of the individual treatment plants in HVB and BPP. The waters are from an accumulation point run into a centrifuge. Wastewater from the centrifuge is run to a wastewater tank and further to evaporators for wastewater treatment at SVO 3, concentrated to ca. 200 g/l of salts and the concentrate is moved to a tank with concentrate in the interim storage of liquid RAW. The tank also contains radioactive sludge from centrifugation or sedimentation of radioactive wastewater. Condensate after final treatment on SVO 3 filters is recycled at ETE for home consumption.

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 system for collection, storage and conditioning of solid RAW includes

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

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.

A part of the solid RAW from ETE, which meets requirements under Decree No. 307/2002 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/r. All this is demonstrated in documents supporting the application for a license to operate a repository (particularly in safety analyses from which 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 m^3, 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.

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 A view into a storage chamber in RAW Repository Richard

8.2.3.2 RAW Repository Bratrství

The repository is designed exclusively for waste containing natural radionuclides.

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.

Fig. 8.2 A view into a storage chamber in the Bratrství repository

8.2.3.3 RAW Repository Dukovany


Fig. 8.3 Closing a full vault with concrete

RAW Repository Dukovany has been developed in the site of NPP Dukovany to dispose of conditioned RAW from the nuclear energy industry. A potential release of radionuclides into the biosphere is prevented by a system of barriers with a long service lifetime. The repository has been in operation since 1995. The total volume for waste disposal is 55 000 m^3 (ca. 180 000 200-liter drums) is sufficient to accommodate all RAW from NPP Dukovany and NPP Temelín, provided the waste meets acceptance conditions for disposal, even in case the operation time of the plants is extended to 40 years. 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. The repository is operated based on a license for operation issued SÚJB.

Fig. 8.4 A view into a partly filled vault in RAW repository Dukovany

8.2.3.4 RAW Repository Hostím

RAW Repository Hostím was in operation in 1959 – 1964. It was built in 1959 in limestone mine Alkazar nearby the village of Hostím by adaptation of two galleries driven in 1942 -1944. The total volume of the two galleries was about 1690 m^3. The repository contains low-and intermediate-level wastes from ÚJV Řež a. s. and ÚVVVR. The operation of the repository was terminated in 1965.

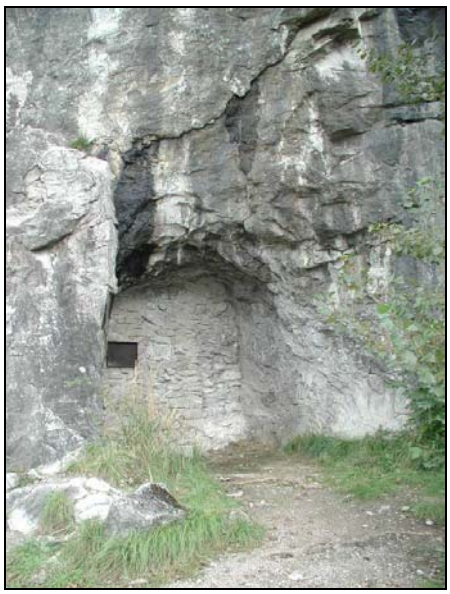

Fig. 8.5 Secured entrance into the Hostím repository

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

inventory taking was performed and all long-term radionuclide sources and chemical wastes were removed from the repository.

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

8.2.4 ÚJV Řež a. s.

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

- building 241 – Velké zbytky (RAW management facility) with technology for RAW processing,
- building 211/8 – HLW storage facility.

Apart from the mentioned facilities, there are additional facilities that had been in the past used for RAW management purposes. The latter are no more in operation, they form a part of old environmental loads and have been gradually removed. They include:

- building 211/6 – Reloading site for RAW,
- storage area for RAW Červená skála,
- building 211/5 – Decay tanks for RAW.

8.2.4.1 Building 241 – RAW Management Facility Velké zbytky

Building 241 contains the following process equipment for RAW management:

- FDS – installation for fragmentation and decontamination of RAW. FDS also serves as a development base to improve the existing and develop new decontamination procedures and technologies,
- equipment for compacting of solid pressable RAW – low-pressure screw mechanical press for compressible RAW (paper, PE, rubber, cellulose wadding, etc.),
- evaporation system for concentration of liquid RAW – to process liquid RAW produced mostly by research facilities within ÚJV Řež a. s.,
- solidification of liquid and solid RAW by cementation – for both solid and liquid (concentrate) RAW.

The performed and planned measures to improve safety in Building 241 have been as follows:

- FDS – the facility was introduced recently and no steps are necessary to improve its safety. It has been gradually provided with new fragmentation and decontamination technologies,
- equipment for compacting of solid compressible RAW – a new hydraulic press will be introduced in 2005,
- evaporation system to concentrate liquid RAW – the system was introduced only recently and no steps are necessary to improve its safety,
- solidification of solid and liquid RAW by cementation – will be provided with new technology in the future,

- in 2004 a new stationary dosimetric system and system for monitoring of radioactive aerosols in the air were introduced, the systems have been test-operated by now.

In addition to the above-mentioned technologies, Building 241 also includes old process equipment, already decommissioned. There are e.g. old evaporation systems for concentration of liquid RAW, storage tanks etc. The technology forms a part of old environmental liabilities to be liquidated in the nearest future. Additional measures relating to radiation protection will be necessary during the process of liquidation.

8.2.4.2 Building 211/8 – HLW Storage Facility

The HLW storage facility has been designed to store SF from research nuclear reactors and solid RAW. The facility is a prefab hall with the ground plan 12 × 72 m, 15 meters high. Inside the space is divided into eight concrete square-shaped boxes to store solid RAW, SF EK–10, in dry concrete casks. Two cylindrical tanks are used for SF IRT–M. Each box contains an inner corrosion resistant tank placed in a tank made of carbon steel set in a concrete bed. The tank diameter is 4.6 m, water level 5 m. The storage area is divided horizontally into three levels with concrete panels. The upper covering layer consists of two shielding panels.

The following safety improvements have been made in the Building 211/8 – HLW storage facility:

- installation of an automatic monitoring system for conductivity of the shielding water in SF pool , with automatic start-up of the demineralization station,
- construction of new cable routes for the physical protection system in the HLW storage facility; unlike in the past, the cables are now under the ground,
- improvement of the physical protection system – replacement of the tanks covers – the original covers were made of steel profiles and Plexiglas and they have been replaced with all-metal covers with the minim weight of each part 150 kg. The covers cannot be taken off without a crane,
- in 2004 a new stationary dosimetric system and system for monitoring of radioactive aerosols in the air were introduced, the systems have been test-operated by now.

8.3 Siting of Proposed Facilities

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

(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;

(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;

(iii) to make information on the safety of such a facility available to members of the public;

(iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating

to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.

2. *In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.*

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

- Decree No. 215/1997 Coll., on criteria for siting of nuclear installations and very significant sources of ionizing radiation,
- Decree No. 214/1997 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,
- Decree No. 307/2002 Coll., on radiation protection,
- Decree No. 144/1997 Coll., on physical protection of nuclear materials and nuclear installations and their classification.

As mentioned in 5.2.2, siting of a NI is one of the activities for which SÚJB shall issue a license in agreement with Section 9, paragraph 1, letter a) of the Atomic Act from the viewpoint of nuclear safety and radiation protection. The preconditions for the license issue under Section 13 of the Atomic Act are:

- *„evaluation of the environmental impact of the nuclear installation“* under Act No. 100/2001 Coll., on assessment of impacts on the environment,
- *„approval of a quality assurance program for the licensed activity.“*

An application for the license to site a nuclear installation shall be in agreement with Appendix A to the Atomic Act supported with:

- Initial Safety Report which shall include:
  - description and evidence of suitability of the selected site from the aspect of siting criteria for NIs or RAW repositories as established in a legal implementing regulation;
  - description and preliminary assessment of the design concept from the viewpoint of requirements laid down in implementing regulations for nuclear safety, radiation protection and emergency preparedness;
  - preliminary assessment of impact of operation of the proposed installation on personnel, the public and the environment;
  - proposal of a concept for safe decommissioning;
  - assessment of quality assurance in the process of selection of site, method of quality assurance for preparatory stage of construction and quality assurance principles for linking stages.
- Analysis of needs and possibilities of physical protection.

More detailed requirements for the content of the Initial Safety Report are provided in a SÚJB guideline.

Decree No. 215/1997 Coll. establishes criteria to assess suitability of the selected site from the viewpoint of nuclear safety and radiation protection. The protection of interests from other aspects, as required by the valid legislation, remains unchanged. The Decree defines following excluding and conditional criteria:

- the excluding criteria positively exclude the location to be used as a site for a NI or repository. The criteria include both radiological effects of the considered installation on its surroundings under planned operating conditions and in case of a radiation accident, and also effects of the location on the radiation and nuclear safety of the installation,
- the conditional criteria enable to use the territory or land as a NI site under condition that a technical solution is possible or available to address unfavorable local conditions, both natural or caused by human activities.

The implementing regulation to the Atomic Act, Decree No. 195/1999 Coll., on requirements for nuclear installations to assure nuclear safety, radiation protection and emergency preparedness and, particularly in Decree No. 215/1997 Coll., on criteria for siting of nuclear installations and very significant sources of ionizing radiation, take into account IAEA recommendations and methodical guidelines concerning siting of nuclear installations.

In agreement with the IAEA recommendations the above-mentioned implementing regulations of the Atomic Act require that the design shall take into account the historically most serious phenomena reported for the given location and its surroundings and effects of a combination of natural phenomena and phenomena initiated by human activity and emergency conditions caused by such phenomena. The regulations further require for siting and designing that NI is evaluated from the viewpoint of resistance against the following natural phenomena and phenomena initiated by human activity:

- earthquake,
- climatic effects (wind, snow, rain, outdoor temperatures etc.),
- floods and fires,
- fall of an aircraft and falling objects,
- explosion of industrial, military and transport facilities, including explosions of nuclear installation objects,
- leakage of hazardous explosive liquids and gases.

Based on a probabilistic evaluation some events may be excluded, provided their probability is very low. Specification of the limit level for the individual cases is within the SÚJB competence.

Act No. 18/1997 Coll. in Section 4 paragraph 4 requires for operating NIs, as a part of re-assessment after a certain period of time or as a part of periodic inspections of safety documents, to reassess effects of the above-mentioned external events, using the current technical standards and knowledge and taking into account potential changes in the location.

SÚJB shall, in agreement with Section 3 paragraph 2 letter k) and letter v) of the Atomic Act, provide to municipalities and District Offices data about RAW management on the territory they administrate and provide information under special regulations (Act No. 123/1999 Coll. as enacted

by Act No. 132/2000 Coll., on the right for information about the environment and Act No. 106/1999 Coll., on free access to information) and elaborate once a year a report on its activities and submit it to the government and to the public.

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

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

8.3.1 Nuclear Power Plant Dukovany

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

8.3.2 Nuclear Power Plant Temelín

At the moment ETE is not planning to site any additional facility for RAW management. Siting of the existing buildings and facilities for RAW management took place in the proceedings to site the entire NPP as described in the Initial Safety Report.

Similarly as in case of EDU, more detailed information about the site and its protection against various natural and man-induced events is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003.

8.3.3 SÚRAO

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

8.3.4 ÚJV Řež a. s.

At the moment ÚJV Řež a. s. is not planning to site any additional facility for RAW management.

Siting of the existing buildings and facilities for RAW management (Building 241 and HLW storage facility) took place within the proceedings to site the entire nuclear installation under the valid legislation. Safety of the facilities has been reassessed in agreement with the Atomic Act and its implementing regulations, as required for the siting, design, construction and operation of nuclear installations.

8.4 Design and Construction of Facilities

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

(i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;

(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;

(iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;

(iv) the technologies incorporated in the design and construction of a radioactive waste management facility are supported by experience, testing or analysis.

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

- Decree No. 195/1999 Coll., on requirements for nuclear installations to assure nuclear safety, radiation protection and emergency preparedness,
- Decree No. 214/1997 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,
- Decree No. 307/2002 Coll., on radiation protection,
- Decree No. 144/1997 Coll., on physical protection of nuclear materials and nuclear installations and their classification.

As stated in chapter 5.2.2, construction of a nuclear installation is an activity subject to a license by SÚJB in agreement with Section 9 paragraph 1, letter b) of the Atomic Act from the viewpoint of nuclear safety and radiation protection. All the following preconditions shall be met to issue a license for construction of a nuclear installation under Section 13 paragraphs 5 and 6 of the Atomic Act:

- Approved quality assurance program for the licensed activity,
- Approved quality assurance program for the designing,
- Approved proposal of a method to assure physical protection of the nuclear installation and nuclear materials.

An application for a license to construct RAW Repository and facilities for RAW management, which are a part of a nuclear installation, shall be supported with the following documents in agreement with Appendix B of the Atomic Act:

- Preliminary Safety Report which shall include
  - evidence that the proposed design meets all requirements for nuclear safety, radiation protection and emergency preparedness as laid down in implementing regulations,
  - safety analyses,
  - information on predicted lifetime of the nuclear installation,
  - assessment of nuclear waste generation and nuclear waste management during commissioning and operation of the installation or workplace being licensed,
  - concept of safe termination of operation and decommissioning of the installation or workplace being licensed, including disposal of nuclear waste,
  - concept for spent nuclear fuel management,
  - assessment of quality assurance during preparation for construction, method of quality assurance for the carrying out of construction work and principles of quality assurance for linking stages,
  - list of classified equipment.
- Proposed method of physical protection assurance.

After favorable assessment of the above-listed documents SÚJB will issue a license for construction of a nuclear installation while the list of classified equipment and proposed method of physical protection assurance shall be subject to SÚJB approval.

8.4.1 Nuclear Power Plant Dukovany

EDU is involved in preparation of input documents for installation of new equipment to treat sludge and ion exchangers. The process has been under way for several years. A schedule for commissioning of the process equipment is specified in a decision issued by SÚJB.

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

8.4.2 Nuclear Power Plant Temelín

The basic design for ETE, and therefore also facilities for RAW management, was elaborated by the Czech designing organization Energoprojekt. The design was assessed in the early 1990s by independent experts in RAW management.

Their conclusions resulted in a fundamental revision of the entire system of RAW management. An overview of the implemented changes is provided in the National Report under the Joint Convention submitted by the Czech Republic, Revision 1.1, of February 2003.

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

8.4.3 SÚRAO

8.4.3.1 RAW Repository Richard

RAW repository Richard is designed to dispose institutional RAW containing artificial radionuclides.

The repository is situated on the northwestern edge of the Litoměřice cadastre area under the Bídnice hill.

In the past there were three limestone quarries in the location (now called Richard I - III) and there was an underground factory construction during the World War II. Limestone had been quarried here until 1960s by Čížkovické cementárny a vápenky.

In the early 1960s the mine work Richard II was identified as a potential repository for low-level RAW.

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

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

Among other things, 13 drills were made in the Richard repository to monitor hydrogeologic conditions in the concerned area, 9 of which for monitoring purposes and the remaining ones for prospecting purposes.

The mine work is stable from the geotechnical viewpoint.

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

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

8.4.3.2 RAW Repository Bratrství

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

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

Two factors are specific for the repository operation:

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

The mine work is stable from the geotechnical viewpoint.

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

Radiation protection is ensured by monitoring in agreement with a monitoring program approved by SÚJB. A concept has been approved for the repository's decommissioning.

8.4.3.3 RAW Repository Dukovany

RAW Repository Dukovany has been in permanent operation since 1995. It consists of 112 vaults arranged in four rows, each with 28 vaults sized 5,3 x 5,4 x 17,3 m. Four vaults make up 1 dilatation unit, with a free space between the dilatation units filled with wood-cement board. Each vault is covered with 14 sloping panels of three types. The engineering barriers in RAW repository are represented by the waste form itself (bitumen, compacted RAW), walls from reinforced concrete and asphalt-propylene layer. RAW repository Dukovany is situated above the underground water level and has a double drainage system.

The filled vaults are covered with concrete (and topped with a thick-wall PE), with a drain hose to release potential gases. Once the repository is filled the construction will be insulated from the top (to prevent rainwater from permeating).

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

8.4.3.4 RAW Repository Hostím

RAW Repository Hostím developed in former limestone mine Alkazar near Beroun was in operation in 1959 - 1964. It was established based on the Governmental resolution 231/1979 and related resolutions by the ministry of chemical industry.

RAW is disposed in the repository in two galleries:

- Gallery A was adapted and used by the former ÚJF Řež (predecessor of ÚJV Řež a. s. and ÚJF AV ČR). The RAW was stored free (in tins, glass jars, air-conditioning filters),
- Gallery B was used by ÚVVVR Praha within the framework of the then established and state-subsidized system for gathering and disposal of RAW. The RAW was mostly stored in 60 l zinc-plated drums and some contaminated voluminous equipment was free stored.

The operation of the Hostím repository was terminated by a decision issued by the Regional Hygienic Officer in 1965, which anticipated the waste would be disposed here "forever". The resolution was in agreement with the then effectual regulations and the state took charge of the

future safety of the Hostím repository. The repository has been closed since 1997.

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

8.4.4 ÚJV Řež a. s.

8.4.4.1 Building 241 – RAW Management Facility Velké zbytky

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

The design of refurbishment of the evaporation system was elaborated in 1987. The main technological units were delivered to ÚJV Řež a. s. in 1988. Preparatory installation works started in 1988, the installation of the new evaporator in agreement with the design adapted in 1988 started in 1989 and was completed in August 1990. Comprehensive non-active tests were performed in August – December 1990. After the comprehensive tests ČSKAE, based on a request made by ÚJV Řež a. s., approved in 1992 the evaporation system into trial operation. In 1994 SÚJB issued a decision to approve the Limits and conditions of the evaporation system for concentration of liquid RAW and approved its permanent operation.

The fragmentation and decontamination center was put into operation in 1995. The following safety-related documents were elaborated:

- Fragmentation and decontamination center, Building 241, Preliminary Safety Report, 1994,
- Pre-operational Safety Report for the Fragmentation and decontamination center, Building 241, 1996.

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

8.4.4.2 Building 211/8 – HLW storage facility

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

The Pre-operational Safety Report for the HLW storage facility (Building 211/8) from 1995 was elaborated as a part of documents submitted in 1995 by ÚJV Řež a. s. to support the application for trial operation of the store. The report included:

- data specification and initial information,

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

The documents also included a preliminary proposal of a decommissioning method for the high-level waste storage facility.

After the submitted documents were favorably assessed SÚJB approved permanent operation of the high-level waste storage facility. At the same time SÚJB approved the limits and conditions for the permanent operation of the high-level waste storage facility.

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

8.5 Assessment of Safety of Facilities

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

(i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;

(ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;

(iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).

As described in the previous chapter 8.4., an applicant for a license for construction of a repository or RAW management facility, which is a part of a nuclear installation, shall meet the requirement specified in the chapter, i.e. to submit a preliminary safety report. The report shall include safety analyses and analyses of unauthorized handling of nuclear materials and ionizing radiation sources and evaluation of their consequences for the workers, population and the environment.

Any changes performed in the course of the operation, significant from the viewpoint of nuclear safety or radiation protection (e.g. refurbishment or innovation), are subject to a license under Section 9 paragraph 1 letter f) of the Atomic Act.

Decree No. 307/2002 Coll., on radiation protection, requires in Section 52 paragraph 5 the following: The meeting of requirements for radiation protection in disposal of RAW shall be demonstrated in safety analyses of potential consequences of RAW disposal. The safety analyses shall in a demonstrable and credible manner and based on knowledge of the potential repository location, evaluate the potential risks during the operation and after the repository is closed. The safety analyses are used to derive acceptability criteria for RAW disposal. Requirements for the content of safety reports are provided in SÚJB recommendations.

The criterion established by the regulatory body in Section 52 paragraph 6 Decree No. 307/2002 Coll. is the optimization constraint for safe disposal of RAW. The optimization limit for safe disposal of RAW is the efficient dose of 0.25 mSv per calendar year for individuals from the critical group of population. Other requirements for radiation protection assurance in RAW management are described in chapter 6.4 Operational Radiation Protection.

Before starting the operation, in addition to the application for a license, the applicant shall submit a preoperational safety report containing updated safety analyses and evaluation of impacts on the environment. More details are provided in 8.6.

8.5.1 Nuclear Power Plant Dukovany

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

For management of liquid RAW the causes of integrity defects in the considered system have been defined and evaluation has been performed of the final consequences and probability of the given initiation event and adverse impacts on the environment. The most serious incident, defined as leakage of radioactive materials, is damage of tanks with the liquid media. The event may occur only as a result of seismic event accompanied by destruction of the building structure and permeation by radioactive materials through all process and construction barriers. Calculation models have shown that even if conservative assumptions are used and for the scenario of leakage of all liquid RAW from the storage tanks into watercourses, an individual from a critical group of population will receive the effective dose 0.2 mSv/year. In the scenario of the waste leakage into the underground water the effective dose will be 0.04 mSv/year. The general limit for an individual from population is 1 mSv/year.

Another potential incident with a substantial impact on the environment is a fire of the bituminization line. Results of calculations of radiological impacts of the bituminization line fire have implied that even under the most conservative assumptions (the model e.g. anticipates that the person in the afflicted area will only eat food from the local sources) the individual effective dose for an individual from population will not exceed 0.2 mSv/year. Decree SÚJB No. 307/2002 Coll. defines a general limit for the population, as a sum of effective doses from external exposure and effective dose commitments from internal exposure at 1 mSv per calendar year.

The most significant incident in the management system for gaseous RAW (due to the maximum potential impact on the surroundings of the nuclear power plant) is a damaged integrity of the system of cleaning of technological venting in the main production building. Using a standard calculation model the annual effective dose for an individual from population is max. 20 μSv, which represents 2 % of the basic general limit 1 mSv/year.

8.5.2 Nuclear Power Plant Temelín

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

For management of liquid RAW the causes of integrity defects in the considered system have been defined and evaluation has been performed of the final consequences and probability of the given initiation event and adverse impacts on the environment. The most serious incident, defined as leakage of radioactive materials, is damage of tanks with the liquid media. The event may occur only as a result of seismic event accompanied by destruction of the building structure and permeation by radioactive materials through all process and construction barriers. Calculation models have shown that even if conservative assumptions are used and for the scenario of leakage of all liquid RAW from the storage tanks into watercourses, an individual from a critical group of population will receive an effective dose 0.1 mSv/year. In the scenario of the waste leakage into the underground water the effective dose will be 0.03 mSv/year. The general limit for an individual from population is 1 mSv/year.

Another potential incident with a substantial impact on the environment is a fire of the bituminization line. Results of calculations of radiological impacts of the bituminization line fire have implied that even under the most conservative assumptions (the model e.g. anticipates that the person in the afflicted area will only eat food from the local sources) the individual effective dose for an individual from population will not exceed 0.02 mSv/year. Decree SÚJB No. 307/2002 Coll. defines a general limit for the population as a sum of effective doses from external exposure and effective dose commitment from internal exposure at 1 mSv per calendar year.

The most significant incident in the management system for gaseous RAW (due to the maximum potential impact on the surroundings of the nuclear power plant) is a damaged integrity of the system of cleaning of technological venting in the main production building. Using a standard calculation model the annual effective dose for an individual from population is max. 2 μSv which represents 0,2 % of the basic general limit 1 mSv/year.

8.5.3 SÚRAO

8.5.3.1 RAW Repository Richard

A revision of safety analyses for RAW repository Richard was prepared in 2003 which is a continuation of safety analyses and their revisions performed in 1995, 1998 and 1999 and used as supporting documents for the application for a license to operate the repository.

The safety analyses performed in 2000–2003 were supposed to verify the repository capacity and to reassess the already proposed decommissioning. The efforts included safety evaluations for options with and without a backfilling material in the repository premises, taking into account the

updated information on the source term, including RAW inventory and employment of different types of filling materials, particularly bentonites and materials on cement basis.

The transport model has been updated using data from the newly made drill holes to further specify hydrogeologic data in the location.

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

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

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

8.5.3.2 RAW Repository Bratrství

The safety analyses performed in 2000–2003 were supposed to verify the repository capacity and to propose limits and conditions for its operation. The efforts included safety evaluations for options with and without a backfilling material in the repository premises, taking into account the updated information on the source term, including RAW inventory and employment of different types of filling materials, particularly bentonites and materials on cement basis.

The safety analyses evaluate individual personal doses in the following scenarios: transport of radionuclides in the repository and underground water in case of barrier damage, scenario in which persons enter the repository and scenario with the persons stay in the location. The transport of radionuclides was considered in two variants – with and without a backfilling material. The scenarios were anticipated to take place after termination of institutional control, i.e. 300 year after the operation of the facility is finished. Individual doses calculated for the real repository system (inventory, construction design, and host rock environment) were compared with the applicable limits and acceptability criteria for RAW in the Bratrství repository have been proposed based on the comparison.

8.5.3.3 RAW Repository Dukovany

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

In 2002 new safety analyses were completed that were based on operational experience in the repository. The analyses were used to update the acceptability criteria for RAW Repository Dukovany in connection with other potential forms of RAW to be disposed here. The earlier variants of safety analyses anticipated that the concentrate from NPP operation will be immobilized in bitumen or cement. Due to the need to dispose ion exchangers, sludge and wastes from decommissioning of both the NPPs the safety analyses were extended to include an analysis of potential disposal of other waste types. Subsequently, waste acceptance criteria have been formulated for solidified and non-solidified RAW and the inventory of monitored radionuclides

has been updated to take into account potential hazards of the whole range of the produced radionuclides.

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

8.5.3.4 RAW Repository Hostím

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

The performed analyses have implied that the risks associated with reprocessing and transport of the RAW into another location would be significantly higher than those associated with the existing repository. The repository has been filled with a concrete mixture and closed.

8.5.4 ÚJV Řež a. s.

8.5.4.1 Building 241 – RAW Management Facility Velké zbytky

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

Safety evaluation of the evaporation system and fragmentation and decontamination center was performed and approved by SÚJB. The following documents were submitted to SÚJB to support the license issue:

- Pre-operational Safety Report for the evaporation system for concentration of liquid radioactive waste, 1992,
- Pre-operational Safety Report for the fragmentation and decontamination center (Building 241), 1996.

8.5.4.2 Building 211/8 – HLW Storage Facility

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

The following reports deal with the safety evaluation:

- Preliminary Safety Report – HLW storage facility in ÚJV Řež a. s., ÚJV 1987,
- Pre-operational Safety Report for the HLW storage facility, Building 211/8, 1995, 2002.

8.6 Operation of Facilities

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

(i) the license to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning program demonstrating that the facility, as constructed, is consistent with design and safety requirements;

(ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;

(iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;

(iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;

(v) procedures for characterization and segregation of radioactive waste are applied;

(vi) incidents significant to safety are reported in a timely manner by the holder of the license to the regulatory body;

(vii) programs to collect and analyze relevant operating experience are established and that the results are acted upon, where appropriate;

(viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;

(ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.

The legislative framework for the license to operate RAW repositories and facilities for RAW management in NIs from the viewpoint of nuclear safety and radiation protection consists of the Atomic Act and its implementing regulations, particularly:

- Decree No. 106/1998 Coll., on nuclear safety assurance of nuclear installations during their commissioning and operation,
- Decree No. 214/1997 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,
- Decree No. 307/2002 Coll., on radiation protection,
- Decree No. 144/1997 Coll., on physical protection of nuclear materials and nuclear installations and their classification,

- 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 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 the following:

- Pre-operational safety report which shall contain:
  - description of changes in the original design assessed in the preliminary safety report and evidence that the level of nuclear safety has not been lowered,
  - additional and specific evidence about the assurance of nuclear safety and radiation protection,
  - limits and conditions for safe operation of the repository and RAW management and facility in a nuclear installation,
  - method of RAW management,
  - evaluation of quality of classified equipment,
- Other documents which shall contain:
  - schedule of works,
  - program of works,
  - evidence that previous SÚJB resolutions and conditions have been met,
  - evidence of the personnel preparedness,
  - on-site emergency plan,
  - method of physical protection assurance,
  - program of operating inspections.

An application for a license to operate shall be supported under Appendix D of the Atomic Act with the following documents:

- amendments to the preoperational safety report,
- evaluation of results of the trial operation,
- evidence that previous SÚJB decisions and conditions have been met,
- evidence of preparedness of the equipment and personnel,
- schedule of operation,
- updated limits and conditions for safe operation,
- proposed method of decommissioning,
- estimate of decommissioning costs.

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 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. 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.

8.6.1 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.

The 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. 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 2004 two inspections of RAW management were conducted at EDU, which concentrated on compliance with limits and conditions for safe RAW management and on compliance with Sections 48 – 51 and 53 – 55 of Decree No. 307/2002 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.

8.6.2 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.

The 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. 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 2004 three inspections of RAW management were conducted at ETE which concentrated on compliance with limits and conditions for safe RAW management and compliance with Sections 48 – 51 and 53 – 55 of Decree No. 307/2002 Coll., on radiation protection, and on compliance with requirements of Decree No. 214/1997 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.

8.6.3 SÚRAO

8.6.3.1 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.

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 following maximums were measured in 2004:

in front of room No. 18 $1{,}7.10^{3}$ Bq/m^{3}

The limit volume activity for the repository atmosphere is 3.10^{4} Bq/m^{3}.

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. Exposure times of workers

were monitored in months for each type of the premises and the maximum time spent in either type of the premises was shorter than 300 hours per year in 2002-2004. The measured EOAR values were from 780 Bq/m^3 to 16 300 Bq/m^3.

Maximum intake

The maximum intake of radon for a worker in the course of 2004 was 0.68 MBq, which corresponds to the dose 4.56 mSv. 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 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).

In 2004 two inspections of RAW management were conducted at the Richard repository which concentrated on compliance with 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., on radiation protection. Results of the inspections did not indicate violation of the above mentioned regulations.

Tab. 8.1 Summary data on RAW Repository Richard

Beginning of operation	1964
End of operation	2070
Repository depth under the surface	70 - 90 m
Total volume adapted for the repository	17 050 m^3
Filled volume	6 260 m^3 (net volume of disposed RAW 2 152 m^3)
Free volume	2 040 m^3 (filling rate ca. 35 %)
Access tunnel and other communications (including that to Richard I)	8 750 m^3
Activity converted as in 2004	see chapter 4.2.3.1.

8.6.3.2 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 its 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.

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 $RaSO_4$ 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.

By now the following activity of natural radionuclides has been disposed in the Bratrství repository (see chapter 4.2.3.2):

Tab. 8.2 Summary data about the Bratrství repository

Beginning of operation	1972
Scheduled end of operation	2030
Repository depth under the surface	over 50 m
Total volume adapted for the repository	3 500 m^3 (the anticipated storage layer is 2 m, however it may be more in rooms No. 1, 4 and 5)
Filled volume	880 m^3 (net volume of disposed RAW 264 m^3)
Free volume	320 m^3 (filling rate ca. 30 %)
Activity converted as in 2004	see chapter 4.2.3.2

In 2004 one inspection of RAW management was conducted at the Bratrství repository which concentrated on compliance with limits and conditions for safe RAW management, acceptance conditions for disposal and on compliance with Sections 52 – 55 of Decree No. 307/2002 Coll., on radiation protection. Results of the inspection did not indicate violation of the above mentioned regulations.

8.6.3.3 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 receiving inspection of RAW includes evaluation of compliance with activity limits for the monitored radionuclides.

Tab. 8.3 Summary data on RAW Repository Dukovany

Beginning of operation	1995
Scheduled end of operation	2100
Repository depth under the surface	0 m
Total volume adapted for the repository	55 000 m^3
Filled volume	4 733 m^3
Free volume	50 267 m^3 (filling rate ca. 8.5 %)
Activity converted as in 2004	see chapter 4.2.3.3

In 2004 two inspections of RAW management were conducted at the Dukovany repository which concentrated on compliance with limits and conditions for safe RAW management, acceptance conditions for disposal and on compliance with Sections 52 – 55 of Decree No. 307/2002 Coll., on radiation protection. Results of the inspections did not indicate violation of the above mentioned regulations.

8.6.3.4 RAW Repository Hostím

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.

Tab. 8.4 Summary data on RAW Repository Hostím

Beginning of operation	1959	
End of operation	1964	
Final sealing	1997	
Repository depth under the surface	Ca. 30 m	
	Gallery A	**Gallery B**
Repository volume	ca. 470 m^3	1220 m^3
Total volume of disposed RAW	ca. 1/3 of the gallery	200 m^3
Activity converted as in 1991-1997	see chapter 4.2.3.4	see chapter 4.2.3.4

8.6.4 ÚJV Řež a. s.

8.6.4.1 Building 241 – RAW Management Facility Velké zbytky

SÚJB has issued the following licenses concerning operation of the facility in the Building 241 Velké zbytky:

- license for operation of a workplace with significant sources of ionizing radiation, license for handling of sources of ionizing radiation from 1999,
- license for RAW management, which covers gathering, sorting, treatment, processing and storage of RAW, the license from 2004 approves the limits and conditions for RAW management ÚJV Řež a. s.

RAW management in ÚJV Řež a. s. is further governed by the following internal procedures:

- RAW management in ÚJV Řež a. s. (2001),
- Radiation protection (1999, revision 2001),
- Rules of Organization ÚJV Řež a. s. (2000),
- Metrological Manual ÚJV Řež a. s. (2001),
- Monitoring program ÚJV Řež a. s. (2001),
- On-site emergency plan ÚJV Řež a. s. (2001),
- Accounting for ionization radiation sources in ÚJV Řež a. s. (1999),
- System of employees training in radiation protection and nuclear safety in ÚJV Řež a. s. (1999).

The limits and condition for radioactive management have been approved by SÚJB.

8.6.4.2 Building 211/8 – HLW Storage Facility

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

- license for operation of a workplace with very significant sources of ionizing radiation, i.e. a workplace with HLW storage facility – Building 211/8,
- license for operation of a nuclear installation – a workplace with HLW storage facility at the site of ÚJV Řež a. s.
- license to perform refurbishment of the HLW storage, building 211/8, including construction adjustments and construction of a hot cell, repackaging of EK-10 fuel and increase of the pool storage capacity.

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

Management of RAW and sealed sources:

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.

Subsequently, the RAW is sorted based on its nature as follows:

- solid low- and intermediate-level RAW, further divided into:
  - compressible,
  - non- compressible,
- solid low- and intermediate-level RAW,
- solid HLW,
- special RAW.

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 artificial beta and gamma radionuclides,
- waste contaminated with alpha radionuclides,
- waste contaminated with natural radionuclides.

For special RAW additional sorting may be performed, based on processing requirements and disposal conditions, e.g.:

- organic solvents, oils, oil products,
- used sealed radionuclide sources,
- RAW contaminated with alpha radionuclides,
- liquid RAW contaminated with tritium.

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. No.1/2000, Cat. No. 3.9.1., Edition No. 2, Revision No. 0, valid from 15 February 2001 to 31 March 2006,
- On-site emergency plan for operation of workplaces of the operation Disposal of RAW,

- On-site emergency plan for operation of High-level Waste Storage Facility, Building 211/8, Cat. No. 3.9.1.3., Edition No. 1, Revision No. 0, valid since 28 February 2001.

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, Cat. No. o 4.2.6 / 406, Edition No. 2, valid since 4 June 2001,
- Quality assurance program for operation of the High-level waste storage facility, Cat. No. 4.2.8/406, Edition No. 1, Revision No. 1. valid since 4 September 2000.
- Quality assurance program, Implementation of refurbishment of the high-level waste storage facility – building 211/8, Edition No. 1, Revision No. 0, Cat. No.: 4.2.43/315 of 24 July 2003.

In 2004 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 limits and conditions for safe RAW management and on compliance with Sections 48 – 51 and 53 – 55 of Decree No. 307/2002 Coll., on radiation protection. Results of the inspections did not indicate violation of the above mentioned regulations.

Decommissioning Programs

The following proposals for decommissioning have been developed and approved by SÚJB:

- Proposed decommissioning method for the high-level waste storage facility (High-level waste storage facility - Building 211/8), Cat. No. 3.9.8.-3/HLW, Edition No. 1, Revision No. 0,
- 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.

8.7 Institutional Measures after Closure

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

(i) records of the location, design and inventory of that facility required by the regulatory body are preserved;

(ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required;

The Atomic Act defines in Section 18 paragraph 1) the following obligations, among others:

a licensee shall also

- *keep and archive records of ionizing radiation sources, facilities, materials, activities, quantities and parameters and other facts impacting on nuclear safety, radiation protection, physical protection and emergency preparedness, and submit the recorded information to the Office in the manner set out in an implementing regulation;*

- *keep records of radioactive waste by type of waste in such a manner that all characteristics affecting its safe management are apparent;"*

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"*.

8.7.1 SÚRAO

8.7.1.1 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.

8.7.1.2 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.

8.7.1.3 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.

8.7.1.4 RAW Repository Hostím

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 Convention

1. *Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.*

   In so doing:

   (i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;
   (ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;
   (iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;
   (iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;
   (v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.

2. *A Contracting Party shall not license the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.*

3. *Nothing in this Convention prejudices or affects:*

   (i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;
   (ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;
   (iii) the right of a Contracting Party to export its spent fuel for reprocessing;
   (iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.

9.1 Report on the Current Transboundary Movement of SF and RAW

Since 1 January 1993, the founding date of the Czech Republic, there has been no transboundary movement of RAW and since 30 October 1997 there has been no transboundary movement of SF and RAW.

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:

- Council Directive 94/55/EC of 21 November 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 29 January 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,
- Council Directive 96/49/ECof 23 July 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 29 January 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 3 February 1992 on the supervisions and control of shipments of RAW between Member States and into and out of the Community,
- Commission Decision of 1 October 1993 establishing the standard document for the supervision and control of shipments of RAW referred to in Council Directive 92/3/Euratom.

9.2 Report on Experience with Transboundary Transport of SF in 1995 - 1997

The original strategy in the former Czechoslovakia for the end of fuel cycle was based on a contract about transport of SF back to the USSR where the fresh fuel had been bought. The necessary five-years down-cooling of SF of VVER 440 type after it is removal from storage tanks in reactor units and before the transport to the USSR had been designed and also implemented in a central facility for the whole Czechoslovakia in ISFSF at the NPP Jaslovské Bohunice site. For this reason, no such ISFSF facility was included into the design of NPP Dukovany. Therefore until 1992 SF from NPP Dukovany had been transported to NPP Jaslovské Bohunice. After Czechoslovakia split into the Czech Republic and the Slovak Republic in 1993, it was necessary to build a SF interim storage in NPP Dukovany and to transport SF back to the country, which in 1993 already represented a transboundary movement.

International transports of SF from Slovakia to the Czech Republic were performed by rail, based on a series of SÚJB resolutions issued in agreement with all relevant IAEA recommendations „Rules for safe transport of radioactive materials – Safety Series No. 6, Edition 1985 (as amended and modified in 1990)“ and in agreement with the Convention on physical protection of nuclear materials INFCIRC/274/Rev. 1/Add. 7. Insurance of the transports was provided in agreement with the Vienna Convention on Civil Liability for Nuclear Damage and the Joint Protocol relating to the application of the Vienna and Paris Conventions.

In 1995 – 1997 fourteen reimportation transports took place of fuel spent in EDU, from the temporary storage ISFSF SE a. s. at NPP Jaslovské Bohunice back to ISFSF Dukovany.

The approval to use the design of the transport and storage packaging CASTOR-440/84 for transport of SF of VVER 440 type was also used for transit of irradiated nuclear fuel from EWN – Greifswald in Germany, via the Czech Republic, Slovakia to NPP Paks in Hungary. A special license for this transport was issued by SÚJB on 16 February 1996.

Throughout the mentioned period (1995 _ 1997) SÚJB paid maximum attention to these international transports of SF and SÚJB inspectors performed a number of inspections. It is possible to conclude, based on results of the performed inspections, that the inspections of transport identified no violation of requirements for nuclear safety, physical protection, and radiation protection and emergency preparedness.

10. Disused Sealed Sources – Article 28 of the Joint Convention

1. *Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.*
2. *A Contracting Party shall allow for reentry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.*

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., in Section 80 paragraphs 1 and 2 requires also the following documents and data about the ionizing radiation sources:

- source description enabling its unambiguous identification, namely its name, type designation, manufacturer's name, serial or identification number;
- purpose of source management;
- all licenses and other decisions concerning the ionizing radiation source management;
- operational records characterizing the method and scope of ionizing radiation source management; and for an unsealed source, its purpose and consumption balance; and
- records concerning the ionizing radiation source management, acquired in the framework of a systematic surveillance of radiation protection observance, and records of inspection activities,
- the date of physical acceptance of the ionizing radiation source;
- a document on the ionizing radiation source acquisition;
- for a ionizing radiation source that is subjected to a type-approval, except radionuclide sources, a conformity statement issued by its manufacturer, importer or distributor;
- for a sealed source, a certificate of sealed source;
- for an unsealed source, a standard document issued upon the transfer of the source by its previous owner;
- a protocol on an acceptance test, protocols on status tests and protocols on constancy tests;
- if a ionizing radiation source is transferred to another person, data indicating to whom and when the source was transferred; and for unsealed sources, also an accompanying document issued upon such a transfer;

- if a radionuclide source is released into the environment, the records on its release into the environment; and
- if a radionuclide source is disposed of as RAW, the data indicating to whom and when the source was transferred, and a standard document for RAW issued upon such a transfer.

The data under Section 80 paragraphs 1 and 2 of Decree No. 307/2002 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 in written 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 e 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 acceptance conditions for their storage. Among other conditions, the packaging assemblies of such sources shall be leak-tight and easy to handle throughout the storage time.

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

Radionuclide	**Number of sources** [pcs]	**Total activity** [GBq]
^{147}Pm	1	1.34E-04
^{137}Cs	35	2.44E+05
^{60}Co	18	4.24E+05
^{252}Cf	1	3.38E-03
^{238}U	2	9.54E-01
^{226}Ra	1	3.66E-01
^{238}Pu	6	1.12E+02
^{239}Pu	38	2.43E+03
^{241}Am	223	3.37E+03
Total	**325**	**6.74E+05**

Tab. 10.2 Number and radioactivity of disused sealed sources disposed in RAW repository Richard

Radionuclide	**Number of sources** [pcs]	**Total activity** [GBq]
^{90}Sr	231	2.75E+03
^{65}Zn	1	1.77E-03
^{204}Tl	1	9.91E-02
^{147}Pm	4	4.70E+00
^{85}Kr	78	1.37E+03
^{3}H	8	4.35E+03
^{55}Fe	3	2.97E-01
^{137}Cs	296	3.62E+05
^{60}Co	812	4.91E+05
^{252}Cf	1	1.39E+01
^{144}Ce	2	1.81E-03
^{106}Ru	3	1.24E-02
^{133}Ba	5	1.32E-04
^{22}Na	1	7.59E-07
^{57}Co	4	3.73E-05
^{89}Sr	1	2.65E-02
^{239}Pu	42	1.21E+03
^{241}Am	173	7.56E+03
^{14}C	14	1.43E+01
Total	**1680**	**8.70E+05**

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."*

Tab. 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	8,72E-01
^{226}Ra	173	4,16E+02
Total	**180**	**4,17E+02**

11. Planned Activities to Improve Safety

11.1 Nuclear Power Plant Dukovany

The radiation monitoring system at NPP Dukovany will be extended to include the so-called monitoring of airflow from the drying system of SF packagings. The system will perform inspection of hermetic tightness of fuel assemblies in the course of cask drying and at the same time it will check the released airflow for activity.

The system will be used for drying of modified CASTOR 440/84M casks to be used for transport of SF and its storage in the newly developed SF storage facility in 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. Acceptability of a product resulting from the treatment for RAW Repository Dukovany has been verified by safety analyses.

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

As both the units of NPP Temelín were put into permanent operation on 11 October 2004, all activities aimed at safety improvement were on an ongoing basis incorporated in the operating procedures as a part of commissioning of the nuclear installation.

11.3 ÚJV Řež a. s.

The RRRFR program (Russian Research Reactor Fuel Return) which is a part of the GTRI initiative (Global Threat Reduction Initiative) has been launched on 26 May 2004 and is supported by IAEA and US government. The aim of the project is to return fresh and spent highly enriched fuel (enrichment > 20% wt. ^{235}U) of Russian (Soviet) origin, currently stored by foreign operators of research reactors, into the Russian Federation. ÚJV Řež a. s. has been also involved in the program as the operator of LVR-15 reactor which uses IRT-2M fuel type with the initial enrichment of 36% and 80% wt. ^{235}U.

As at 31 December 2004 the HLW storage facility hosted 240 pcs. of fuel assemblies IRT–2M (enrichment 80 % wt. ^{235}U), whose transfer into the Russian Federation for storage and reprocessing has been a subject matter of a contract between the program parties. For the purposes of transport and storage of SF from research reactors Škoda JS, a. s. company developed a Škoda VPVR/M cask for 36 fuel assemblies or hermetic cases containing fuel assemblies of Russian (Soviet) origin. The Škoda VPVR/M cask was type-approved by SÚJB for transport and storage of SF on 23 March 2005. This cask can be used for the transport of SF to the Russian Federation.

In parallel with preparations for transport of SF IRT-2M a national program for rehabilitation of environmental liabilities has been under way in ÚJV Řež a. s., which includes repackaging (see chapter 4.1.3.3), as well as transport of fuel EK-10 into the Russian Federation. It has been planned that all fuel assemblies EK-10 stored dry in the box No. V (190 drums, 200 l each) and wet in the pool B of the HLW storage facility (16 pieces) should be repacked into hermetic cases, placed into baskets of Škoda VPVR/M cask, inserted into the casks in the hot cell of the HLW storage facility and transported to the Russian Federation.

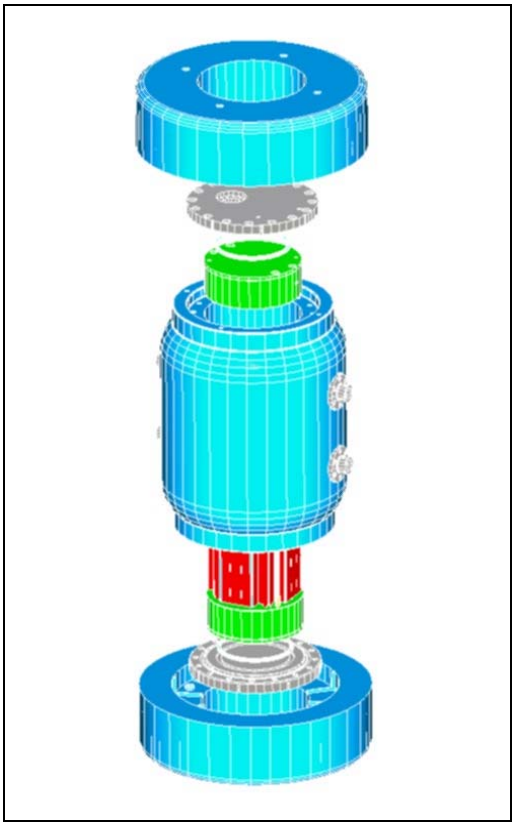

Fig. 11.1 Škoda VPVR/M cask with shock absorbers, basket, primary and secondary lids

11.3.1 Building 241 – RAW Management Facility Velké zbytky

See chapter 8.2.4.1.

11.3.2 Building 211/8 – HLW Storage Facility

See chapter 8.2.4.2.

11.3.3 Other Facilities

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 damages 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 treatment and processing of RAW,
- storage area for RAW Červená skála,
- building 211/5 – Decay tanks for RAW.

11.4 SÚRAO

11.4.1 RAW Repository Richard

A project has been under way under the PHARE program to close a chamber in the Richard repository – the project is divided into two stages: the first stage consists of the technical solution itself, including necessary safety analyses and the second stage is its implementation to be funded based on results of the first stage. The supplier is DBE Technology. Technical specification was developed in late July 2004. The project in continuing under the schedule. The implementation of chamber closing in the Richard repository will follow after completion of the design.

11.4.2 RAW Repository Bratrství

A feasibility study is being developed, based on SÚJB license to operate RAW repository Bratrství, for different closing options of the selected chamber, particularly evaluation of radiation exposure for the individual variants, both for the operating personnel and for the surrounding environment.

11.4.3 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.

11.4.4 RAW Repository Hostím

No further activities are foreseen.

12. Appendices

12.1 List of SF Management Facilities

Tab. 12.1 List of SF Management Facilities

Location	**Facility name**	**Storage capacity** [pieces PS]	**Storage capacity** [tons of HM]
Dukovany	SF pool reactor unit 1	699	83
	SF pool reactor unit 2	699	83
	SF pool reactor unit 3	699	83
	SF pool reactor unit 4	699	83
	ISFSF	5 040	600
Temelín	SF pool reactor unit 1	703	396
	SF pool reactor unit 2	703	396
Řež	SF pool in HLW storage facility	465	
	SF dry store in HLW storage facility	190	
	Wet tank	60	
	SF storage facility	80	

12.2 List of RAW Management Facilities

Tab. 12.2 List of RAW Management Facilities

Licensee for RAW management	Facility	Storage/Disposal capacity
EDU	**Storage of liquid RAW**	
	– RAW concentrate tanks	4500 m^3
	– storage tanks for active sorbents	460 m^3
	Gathering, storage and processing of solid RAW	
	– sorting workplace and storage of solid RAW	1000 t
ETE	**Storage and processing of liquid RAW (BPP)**	
	– storage tanks for active sorbents	200 m^3
	– RAW concentrate tanks	520 m^3
	Collection, storage and processing of solid RAW (BPP)	
	– 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 Hostím	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 center for RAW	1400 m^3

* - total space mined out about 17 050 m^3
** - total space mined out about 3 500 m^3

12.3 List of Nuclear Installations in the Decommissioning Stage

At the development time of this National Report (April 2005) there were no NIs and 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

Tab. 12.3 SF Inventory as on 31 December 2004

Location	**Facility Name**	**Number of stored FAs** [pieces]	**Weight of stored FAs** [tons of HM]
Dukovany	SF pool reactor unit 1	488	58
	SF pool reactor unit 2	607	72
	SF pool reactor unit 3	538	64
	SF pool reactor unit 4	637	76
	CASTOR-440/84 cask at the service area in HVB I.	84	10
	ISFSF	4536	540
Temelín	SF pool reactor unit 1	84	41
	SF pool reactor unit 2	42	21
Řež	SF pool in HLW storage facility	240 + 16**	0.0585
	SF dry storage in HLW storage facility	190***	0.265
	Wet tank	30	
	SF storage facility	51 + 12*	

Explanations:
* – fuel type IRT–2M, 36 % wt. ^{235}U+ IRT–2M, 80 % wt. ^{235}U
** – fuel type IRT–2M, 80 % wt. ^{235}U + EK–10, 10 % wt. ^{235}U
*** – fuel type EK–10, 10 % wt. ^{235}U

12.5 RAW Inventory

Tab. 12.4 Inventory of solid low- and intermediate-level RAW as on 31 December 2004

Licensee for RAW management	Facility	Used storage/disposal capacity
EDU	Storage of liquid RAW	2 424 m^3
	Storage of degraded sorbents	303 m^3
	Gathering, storage and processing of solid RAW	495 t
ETE	Processing of liquid RAW (BPP)	228 m^3
	Collection, storage and processing of solid RAW (BPP)	274.7 m^3
SÚRAO	Repository Richard	6 260 m^3
	Repository Bratrství	880 m^3
	Repository Dukovany	4 733 m^3
	Repository Hostím	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 center for RAW	590 m^3

More details are provided in chapter 4.2.

12.6 Overview of the Czech Legislation

12.6.1 An 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 enacted by Act No. 119/2000 Coll., Act No. 258/2000 Coll., on protection of public health and on alterations in some related acts, as

amended later, and Act No. 2/1969 Coll., on establishing of ministries and other central state administration bodies of the Czech Republic, as amended later,

- Act No. **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 11, 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),
- Decree No. **144/1997 Coll.**, on physical protection of nuclear materials and nuclear installations and their classification,
- Decree No. **145/1997 Coll.**, on accounting for and control of nuclear materials and their detailed specification, as enacted 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 enacted 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,
- Decree No. **307/2002 Coll.**, on radiation protection,
- Decree No. **214/1997 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,
- 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,
- 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,
- Decree No. **419/2002 Coll.**, on personal radiation passes.

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 wastes 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 creation of a reserve for decommissioning of nuclear installation or workplaces in categories III or IV,
- Non-registered ministerial regulation issued by the Ministry of the Industry and Trade, No. **MPO 9/1997,** defining the statute of SÚRAO,
- 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. **71/1967 Coll.**, on administrative procedure (Rules of Administrative Procedure), as amended later,
- 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. **368/1992 Coll.**, on administrative fees, as amended later,
- Decree No. **76/1989 Coll.**, on safety assurance of technical equipment in nuclear energy industry, 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. **50/1976 Coll.**, on land planning and building regulations (Building Act),
- Decree No. **132/1998 Coll.,** implementing some provisions of the Building Act,
- Decree No. **137/1998 Coll.**, on general technical requirements for construction,
- 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 later,
- Act No. **594/2004 Coll.,** implementing the regime of the European Communities to control export of goods and technologies of dual use,
- Act No. **22/1997 Coll.**, on technical requirements for products and on amendments to and alterations of some other acts, as amended later,
- 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. **178/2001 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 wastes 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 later,
- 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,
- Decree No. **328/2001 Coll.**, issued by the Ministry of the Interior on some details of integrated rescue system assurance,
- Decree MV No. **380/2002 Coll**., on preparation and implementation of tasks in population protection.

12.7 Overview of National and International Safety Documents

12.7.1 Nuclear Power Plant Dukovany

Hep J. at all. (1992): Compaction of Spent Fuel Pool EDU – Amendment to Pre-operational Safety Report (PpBZ), ZJS Škoda Plzeň

Team of Authors (1998): Nuclear Power Plant Dukovany, Pre-operational Safety Report, Units 1– 4, Ref. 1/1998, ČEZ, a. s., Nuclear Power Plant Dukovany

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