Czech Republic

National Report

under the

Joint Convention on Safety in Spent Fuel Management and Safety in Radioactive Waste Management

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Revision 1.1

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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 building
BRS (or Council)	National Security Council
ČBÚ	Czech Mining Office
ČR	Czech Republic
ČSKAE	Czechoslovak Atomic Energy Commission
DGR	deep geological repository
EDU	ČEZ, plc, Nuclear Power Plant Dukovany
ETE	ČEZ, plc, Nuclear Power Plant Temelín
EU	European Union
FA	fuel assembly
FDS	fragmentation and decontamination center
FJFI	Faculty of nuclear and physical engineering, Czech University of Technology in Prague
GŘ HZS ČR	General headquarters of the Czech Republic's Fire and Rescue Brigade
HLW	high-level radioactive waste
HM	heavy metal
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
KKC	Emergency Response Center
KP	Crisis Plan
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 Resolution No. 487 of 15 May 2002

PZJ	quality assurance program
RAW	radioactive waste
Joint Convention	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
SF	spent fuel
SFSF	Spent Fuel Storage Facility
SÚJB (or Office)	State Office for Nuclear Safety
SÚJCHBO	State Institute for Nuclear, Chemical and Biological Protection
SÚRAO (or Authority)	Radioactive Waste Repository 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 plc
ÚKŠ (or Staff)	Central Crisis Staff
ÚVVVR	Institute for Research, Production and Utilization of Radioisotopes, Prague
VCNP (or Committee)	Committee for Civil and Emergency Planning
VVER	type identification of light water reactors designed in the former Soviet Union

1. Introduction

This report is the National Report submitted by the Czech Republic for the purposes of assessment meeting of the parties to the Joint Convention. Its objective is to describe the fulfillment status of obligations under the Joint Convention in the Czech Republic as on 31 December 2002. The outline of the National Report is based on recommendations approved at the preparatory meeting of the parties to the Joint Convention in December 2001 and contained in the „Guidelines regarding the form and structure of national reports (JC-SFRW/PREP/FINAL/DOCUMENT 3)" of 13 December 2001.

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

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

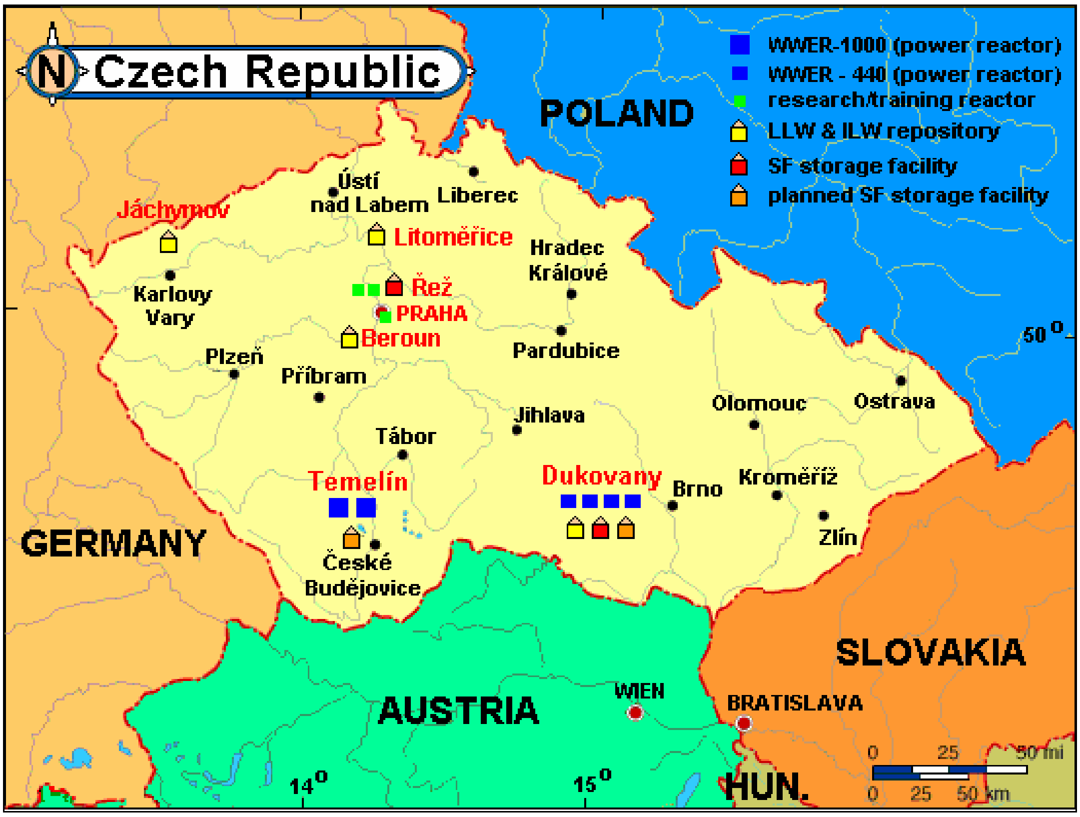

Fig. 1.1 Locations of selected NI and facilities subject to the Joint Convention in the Czech Republic

In addition to the separate nuclear installations NPP Dukovany 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 of VVER 1000/320 type.

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 NI. 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 operation of NPPs, there are the following storage facilities on the Czech Republic's territory:

- RAW repository Richard in Litoměřice (institutional waste; in operation since 1964),
- Repository Bratrství in Jáchymov (permanent storage of wastes with natural radionuclides; in operation since 1974),
- RAW repository Hostím in Beroun (closed in 1997).

2. Categorization of RAW and Policy for RAW Management and SF 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 RAW 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 - transition, low- and intermediate- and high-level RAW:

- Transition 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 is shorter than 30 years (including ^{137}Cs) 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,
- High-level wastes whose 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 NI 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), is the basic document defining a strategy of the state and its agencies in RAW management by about 2025, with an outlook to the end of the 21st century, in respect to generators of RAW and SF. The document proposes solutions to assure liquidation of the wastes in agreement with requirements for protection of human health and the environment, without disproportionately transferring the current consequences of utilization of nuclear energy and ionizing radiation to future generations.

The Policy is based on documents developed in the first half of 1990s and approved by the government and it is in agreement with the national energy policy approved on 12 January 2000 and with the state environmental policy adopted by the Government Resolution No. 323/99 of 14 April 1999. Before its approval the Policy was subject to the strategic EIA process to assess its impact on the environment. Development of the Policy is, inter allia, required also in connection with the country's preparation to join EU, under the Joint Convention signed by the Czech Republic in 1997.

The purpose of the Policy is:

- to establish strategically substantiated principles acceptable in terms of science, technology, environment protection, finance and society, for management of RAW and SF in the Czech Republic,
- to create a basic system framework for decision-making by bodies and organizations responsible for management of and SF in the Czech Republic,
- to provide comprehensible information to all concerned entities and general public about the long-term solution for management 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 Authority 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-livedRAW and HLW is their deposition in DGR; before the facility is put into operation these materials will be stored with their generators or in facilities of the Authority,
- Technology procedures for RAW management and preparation to implement deep underground disposal in the Czech Republic have been in agreement with the legislative requirements and results of foreign research and technology developments. Simultaneously, possibilities of SF retreatment 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. This assures that the costs of deposition for wastes generated now will not be transferred to future generations,

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

2.2.1 Management of Low- and Intermediate-level RAW

Short-lived low- and intermediate-level wastes represent the biggest category in terms of volume. They are generated in liquid or solid form during operation and decommissioning of nuclear reactors and during handling of ionizing radiation sources. These RAW may be after treatment deposited in surface or near- surface repositories. Technologies of their treatment and treatment before disposal have been sufficiently developed and introduced in ČR.

Temporary RAW are stored and once their activity decreases below an established level they are released to be recycled or deposited in secured dumps for non-radioactive waste.

In a smaller extent, some long-livedlow- and intermediate- level wastes are generated which are not acceptable for the now operated near-surface repositories. For this waste requirements will be specified for a method and quality of treatment for storage purposes and subsequent disposal in a deep repository. This type of waste is in most cases stored by its generators while SÚRAO provides for storage of small volume.

2.2.1.1 Management of Low- and Intermediate- level RAW Before Disposal

Before accepted into a RAW repository is conditioned and treated to meet acceptance criteria for disposal established by the Office. The waste is gradually segregated, as a rule in the place of its origin, to reduce its volume. The treatment equipment for RAW includes evaporators, presses, filters and ion-exchanging columns. RAW treatment for disposal involves changes in its physical and chemical properties in order to assure its safe transport, storage and disposal. Cementation and bituminisation technologies are used for this purpose.

At the moment, only several organizations in the Czech Republic hold applicable permits to manage RAW and technological equipment for their treatment and treatment (ČEZ, a. s., SÚRAO, ÚJV Řež a. s., ZAM-SERVIS, s. r. o., UJP PRAHA a. s., Chemcomex, ISOTREND, s. r. o., ALLDECO.CZ a. s. and WADE, a. s.), while some of them provide services to other generators of waste. A method of inspection of RAW properties, critical for its disposal, has been approved and subsequently checked by SÚJB. Similarly, SÚJB has also verified quality assurance programs for processes (i.e. RAW treatment before disposal) and products (treated RAW), including inspecting of the procedures in the generators´ facilities. SÚRAO provides for the takeover of RAW treated before disposal.

Based on the acquired experience it has been concluded that to assure guaranteed standardized RAW treatment before disposal it is convenient to use a system of coordinated utilization of the respective technologies, available to all RAW generators and enabling centralized treatment and treatment of RAW also to generators outside the nuclear energy industry (minor generators) while using suitable methods depending on the RAW nature (decontamination, fragmentation, concentration, cementation, bituminisation, vitrification). The commercial law mostly governs the system utilization and SÚRAO plays the coordination role in the system.

In a medium-term perspective, i.e. in the nearest 10 – 15 years, the following goals will be pursued:

- Coordination and implementation of a research program on RAW management, in agreement with the established priorities, focusing on advanced technologies enabling to minimize the volume of RAW before disposal and on advanced methods of RAW treatment and treatment,
- Assure safe storage of RAW that cannot be deposited in the existing repositories, until their disposal, including specification of requirements for their treatment.

2.2.1.2 Disposal of Low- and Intermediate-level RAW

Only such wastes may be disposed which meet acceptance criteria approved by the Office for a given repository. For low- and intermediate-level waste there are near-surface repositories in the Czech Republic - RAW repositories Dukovany and Richard and repositoriy Bratrství. This type of waste was deposited in the past also in the now closed RAW repository Hostím. Operation of all the repository systems, including monitoring of the already closed RAW repository Hostím, is provided for by SÚRAO in agreement with the respective SÚJB permits and, in case of mines, also in agreement with authorizations and permits under mining regulations. Capacity of the repositories is sufficient for the current production of RAW and for several decades (Dukovany by 2100, Richard by 2070, Bratrství by 2030). Provided that scope of NI in the Czech Republic is maintained no development of new repositories for low- and intermediate-level waste is anticipated, while their existing capacity will be optimized or, if required, extended.

2.2.1.3 Recommendations in the Policy for Low- and Intermediate-level RAW Management

Low- and intermediate-level wastes meeting acceptance criteria are disposed in the existing repositories, seeking maximum utilization of their capacities. Safety documents of the repositories are continually updated. For low- and intermediate-level wastes that cannot be accepted by the existing repositories conditions for treatment will be specified or an appropriate storage capacity will be assigned or developed so that the wastes may be accepted from the generators.

To assure systematic treatment of institutional low-and intermediate-level waste a facility is considered to be developed to gather, segregate and treat it. A procedure from EU legislation will be adopted for decision-making about introduction of wastes into the environment and dumpsites will be identified to accept waste exempt from the operation of the Atomic Act.

2.2.2 SF and HLW Management

Czech NPPs are operated using an open nuclear fuel cycle. Meanwhile, the SF storage facilities enable to take up a delaying position, depending on the SF condition, either in respect to retreatment or newly developed the so-called transmutation technology; Czech organizations participate in the development of the latter within the 5th framework EU program. The basic strategy for SF is their disposal in DGR because also in case of retreatment SF and HLW will continue to exist which will need to be stored in DGR. Due to the simplified technical design to reduce generated heat and radiation the first SF is expected to be handed over for disposal around 2065.

HLW (and after a respective decision SF will be classified as waste) is the most hazardous category of RAW. Its volume is not very big – it accounts for one tenth of all RAW generated on the territory of the Czech Republic. Its source is particularly the operation of power generating and research reactors. Due its high activity levels and high content of long-lived radionuclides it is now assumed that the waste will be disposed in deep underground geologic formations. For direct disposal of SF or treated HLW special packagings (casks) are being developed and suitable structural and insulating materials are being developed and verified. The technologies for treatment of SF and HLW and manufacture of the mentioned storage casks and insulating materials will be continually developed and their selection will be completed after identification of geologic and hydrogeologic conditions are identified in the respective repository.

2.2.2.1 SF and HLW Management before Disposal

In agreement with the Atomic Act generators of SF and HLW shall be responsible for their storage and transport. SF removed from a reactor in EDU is usually stored for 6 years in SF pools, directly in the reactor hall, then placed into CASTOR-440/84 casks and moved to a dry storage facility, in ÚJV Řež a. s. into a wet pool storage. SF storage is a well-mastered technology, verified on long-term basis and, in case of dry storage, also practically waste-free technology. ISFSF Dukovany has been operated in EDU since 1995 with the capacity 600 t HM, which will be filled in 2005. Preparations have been under way to build a new storage facility with a capacity for expected production of SF in EDU, in agreement with the Government Resolution No. 121/97 in two variants: the recommended one is development of separate storage facilities at each NPP site. The backup option is the development of a central underground storage facility at Skalka site. By now decisions about siting have been issued both for EDU and Skalka, while the latter is still considered as backup option. A storage facility for SF from ETE shall start operating after 2010.

HLW are now stored at the locations of their generation. Development of a central storage facility for HLW in the Czech Republic is not expected.

Storage is a stage preceding other operations. The usual storage time of SF before its disposal is several decades and current trends suggest that this period should be further extended. The condition of casks is continually verified and evaluated.

Thick-wall casks are used for transport of SF and HLW, which assure removal of residual heat generated by radioactive decay of radionuclides in the SF and at the same time shield off ionizing radiation below the permissible levels. Dual casks have been used in ČR for transport and storage. All operators of nuclear reactors in the Czech Republic have mastered storage and transport of SF. Storage and transport of HLW has been mastered by all their generators.

2.2.2.2 Treatment of SF and HLW for Direct Disposal

It is expected, in agreement with the worldwide trend, that before disposal in a deep underground repository SF in the Czech Republic will be placed into type-approved casks for disposal, either in its original condition or after dismounting of structural parts that do not contain fuel material. In the Czech Republic the specific design of the packagings has been under development.

2.2.2.3 SF Retreatment and Transmutation

SF may be reprocessed to extract some fission material (Pu and U) or to extract some valuable radionuclides. The extracted uranium and plutonium may be used again (recycled) to produce new nuclear fuel, either uranium-based or mixed (the so-called MOX), containing uranium and plutonium oxides. In the Czech Republic power reactors use the so-called open fuel cycle, for which SF retreatment is not yet anticipated. In case of potential SF retreatment abroad, the resulting HLW will be returned to the generator in vitrified form in thin-wall containers made of high-grade metallic materials (low- and intermediate -level wastes from retreatment are in some cases not returned to the generator). The waste shall be deposited in a deep repository. Similarly, SF made of recycled materials should be also deposited in a deep repository. HLW and SF made of recycled materials have higher thermal output due to their different isotope composition. Therefore the technical design such a repository will be different from the deep repository used for direct disposal of SF and HLW.

Retreatment technologies for SF have been continually improved to separate and subsequently liquidate higher transuranium elements (Am, Cm). In this connection transmutation (nuclear transformation) methods for long-livedradionuclides have been investigated, which may enable to further generate energy. All transmutation technologies are at the moment in the stage of basic research. Results of this research should not be overestimated or underestimated. On the other hand, safe storage of SF provides sufficient time both for construction of a DGR and for development of transmutation methods. Czech research workplaces (e.g. ÚJV Řež a. s.) have been involved in international efforts to develop transmutation procedures.

2.2.2.4 Disposal of SF and HLW

Internationally, disposal of SF and HLW in deep underground repositories is considered the most realistic variant of the final step of RAW management. The purpose of DGR of SF and HLW is to assure long-term separation of the deposited materials from the environment, without any intent to take them out again. The principle of DGR is based on passive safety (i.e. without further human supervision). The repository system consists of a multi-barrier system, i.e. a suitable combination of engineering (artificial) and natural (geological) barriers.

There are several reasons supporting the DGR option:

- Feasibility – the technologies for construction and operation of underground repositories use the existing or modified technical means,
- Safety – after decades of intense research detailed methods are now available for safety assessment (deterministic and probabilistic models, studies of natural analogs),
- Demonstrability – research programs using results from underground laboratories have confirmed function of the proposed technologies and realistic character of the anticipated computations and safety assessments,
- Commissioning of the WIPP (USA) repository – underground repository designed for low- and intermediate-level wastes; licensing authorities accepted evidence of the repository's safety for a period of 10 thousand years; practically it represents an intermediate stage for disposal of SF and HLW.

In the Czech Republic a deep repository is anticipated to be developed in granitic rock formations. It is anticipated that the deep repository will accommodate all RAW that cannot be deposited in near-surface repositories, SF once it is declared as waste and HLW from decommissioning of NPPs.

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 retreatment facilities as part of a retreatment activity is not covered in the scope of this Convention unless the Contracting Party declares retreatment 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.*

As established in Chapter 2 herein, at the moment the Policy does not anticipate retreatment of SF. The use of SF retreatment 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 retreatment economically disadvantageous. From the viewpoint of safety, retreatment does not significantly increase radiation risks but from the viewpoint of disposal, retreatment or treatment procedures for RAW from retreatment, enable separation of long-lived and risky radionuclides and therefore also their optimum treatment before disposal. On the other hand, the requirements for a DGR design to accommodate HLW from SF retreatment are more demanding than in case of direct disposal of SF.

Beyond the scope of requirements in Article 3 of the Joint Convention, chapter 12.9 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 dumps and tailing ponds. Due to the contained radioactive materials these facilities are subject to all applicable criteria for radiation protection and 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 ČR 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 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:

- in NPP Dukovany – SF pools and ISFSF Dukovany,
- in NPP Temelín – SF pools,
- in 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 is 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 SF pools assure the following functions:

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

In the pools the SF is stored in a compact grid with the capacity of 682 positions. SF pool 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 the 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.

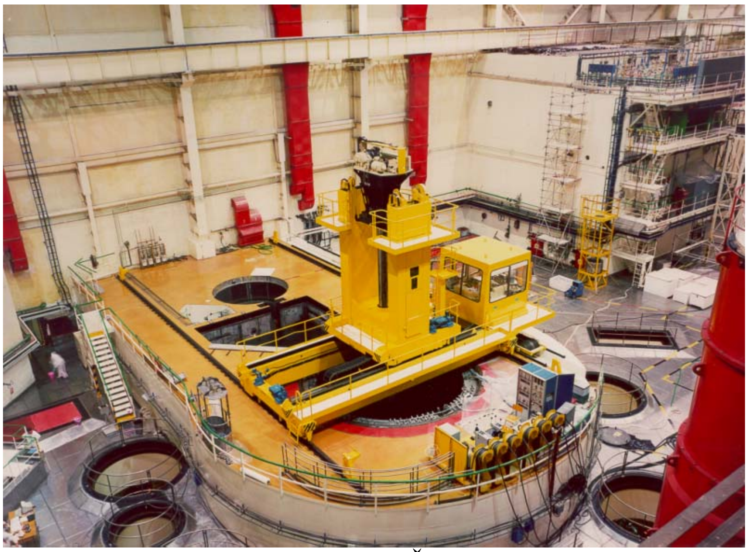

Fig. 4.1 Uncovered SF pool and ŠTK during reactor refueling

As on 31 December 2002 all four pools contained 2288 FA with the total weight 491 920 kg, with the weight of heavy metals about 273 000 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 2002 ISFSF Dukovany contained 46 CASTOR-440/84 casks and the 47th was being prepared by the said date in the reactor hall of unit 3 of NPP Dukovany to be transported to ISFSF. 4-5 casks are transported to ISFSF Dukovany every year.

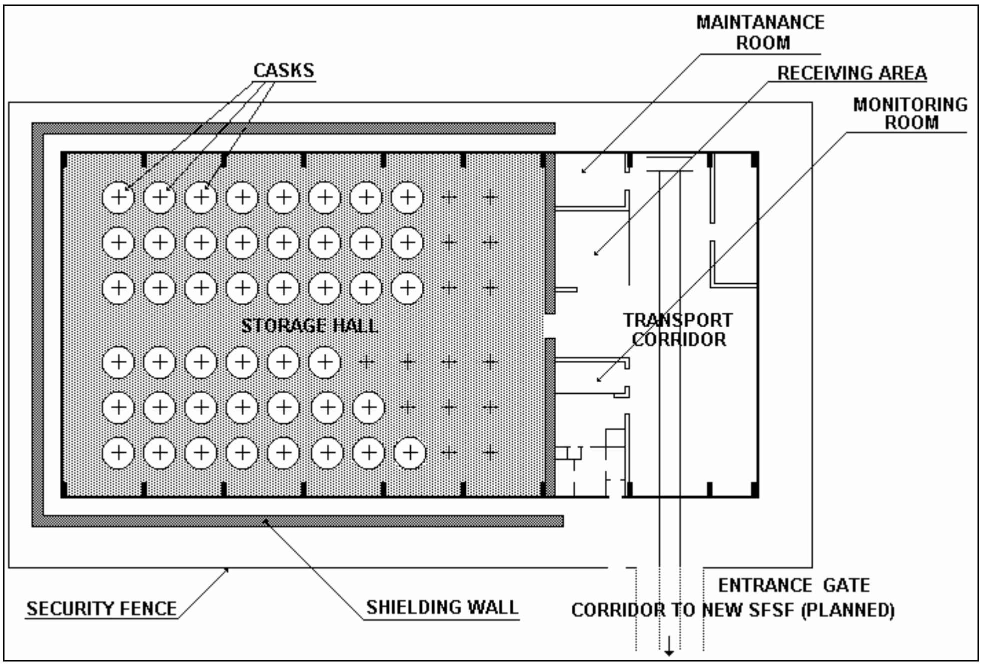

Fig. 4.2 Ground plan of ISFSF Dukovany

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. The entire SF pool enables to store 679 FA, 24 FA in hermetic cases and 2 cluster cases. In a standard storage regime, however, at least 163 positions shall remain free for potential emergency removal of FA from the entire reactor core.

As on 31 December 2002 Unit I of NPP Temelín was in trial operation and Unit II in the stage of power startup and SF pools contained no SF by the said date.

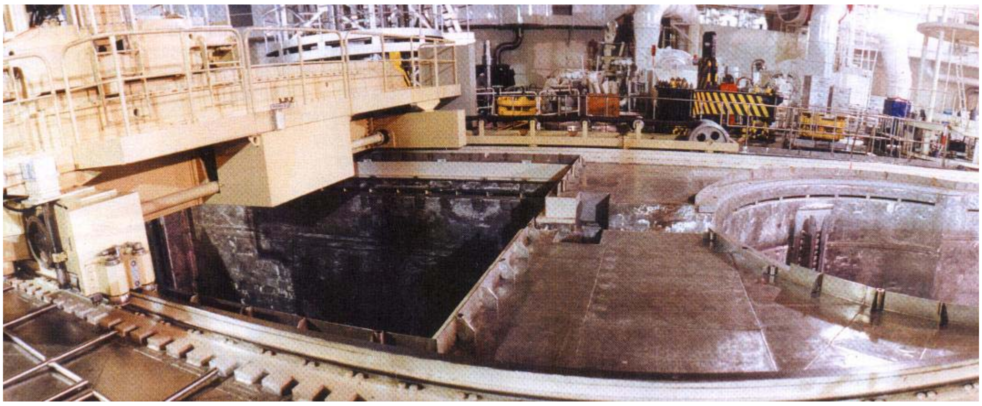
Fig. 4.3 Uncovered SF pool at NPP Temelín

4.1.2.2 SF Storage Facility

In connection with the commissioning of ETE units additional storage capacity will be required for SF in 2014, as the first fuel will be moved from the reactor to SF pool early in 2003.

The most recent plan of ČEZ, a. s. is to develop SFSF directly on the NPP Temelín site and thus eliminate the necessity to transport SF outside the NI site before the SF is handed over to DGR. As part of the plan a feasibility study was made in 2002 to find a suitable location for SFSF inside the NPP Temelín site. Based on the favorable experience with dry storage technology for SF in casks for transport and storage, which ČEZ, a. s. acquired in NPP Dukovany, the technology used for SF storage at NPP Temelín will be similar. In agreement with the Policy the anticipated storage time of SF in the facility will be 60 years.

The implementation of SFSF will be performed in a standard manner. An international tender is expected to be opened for a contractor of storage technology. Individual steps leading to the storage facility implementation will start in near future so that SFSF is available as scheduled.

If ČEZ, a. s. encounters some fundamental problems which may endanger timely implementation of the storage facility at the NPP Temelín location the reserve location Skalka is ready to replace it. Investigations, including the drilling of exploration gallery, were performed in the Skalka location, which is situated about 160 km from the NPP Temelín (to develop an underground dry cask storage facility for SF). At the moment a valid decision for the construction siting is available for the location.

4.1.3 ÚJV Řež a. s.

Since the National Report submitted by the Czech Republic under the Convention on Nuclear Safety of September 2001 does not contain any information on the research reactor LVR-15 and facilities for SF management in ÚJV Řež a. s., this Chapter also includes their brief description and an overview of their basic technical parameters.

4.1.3.1 Research Reactor LVR – 15

The research nuclear reactor LVR–15 (Building 211/1) is designed for research of reactor radiation impact on materials, production of radioactive isotopes and research of neutron radiation properties. The reactor has been used as an intensive neutron source.

The research reactor LVR–15 is a heterogeneous tank reactor with nuclear fuel IRT–2M, enriched to 36 % wt. with ^{235}U. A fission chain reaction is caused by thermal neutrons. Demineralized water is used as moderator and coolant, and water or beryllium sections in water are used as reflectors, depending on the operating configuration.

The nuclear reactor may be in principle operated in three variants of core configuration. The first basic one is the so-called compact configuration with four loop channels, the second is the so-called central trap configuration (water or beryllium). For irradiation of patients the configuration features 4 fuel assemblies in row 10 and air displacers in rows 8 and 9. The core may include 28 to 34 fuel assemblies (from which 12 three-tube assemblies). Each configuration may work with water, beryllium or mixed reflector.

The nuclear reactor is controlled by 12 control rods in total, from which 8 rods for compensation, 3 emergency rods and one rod as a part of the automatic controller.

Fig. 4.4 A view of the LVR–15 reactor core

The coolant in LVR–15 is demineralized water.

The nuclear reactor is designed as a tank reactor with a stainless steel vessel, reactor internals (support plate, separator and horizontal channels) are made of aluminum. Channels for sensors of the protections and control system are vertical and made of stainless steel.

The reactor vessel is cylindrical with the diameter 2300 mm, 6235 mm long. The vessel material is 17246.4 and 08CH18N1OT. The wall thickness is 15 mm and bottom thickness 20 mm.

The vessel is linked with the primary circuit piping. Demineralized water is supplied with two pipes with inner diameter of 300 mm and discharged with one pipe with inner diameter of 400 mm.

Results of computations have shown and measurements have confirmed that the nuclear reactor's shielding is sufficient even for the output of 15 MW_{therm} , not only for the nuclear reactor filled with the coolant (which also acts as a shielding material) but also for the reactor without the coolant (in an emergency situation).

Main design parameters of LVR–15 reactor:

Designed thermal reactor output	15 MW
Operating thermal reactor output	10 MW
Thermal neutron flux density at the thermal output 10 MW:	
– maximum in the core	$2x10^{18}$ $n/m^2.s$
– average in the core	$1x10^{18}$ $n/m^2.s$
– at horizontal channels outlet	$1x10^{13}$ $n/m^2.s$
Maximum coolant flow	2100 m^3/h.
Inlet/outlet coolant temperature	45 ^oC/51 ^oC
Mean power density in the core	123 kW/dm^3.

4.1.3.2 SF Pool in the Reactor Hall

The SF pool is designed to store SF removed from the reactor core. 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.

4.1.3.3 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 7 m and of pool B 440 x 120 cm, depth 7 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 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 about 30 cm below the upper edge. Dry channels are made of concrete, diameter 20 cm, 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 Koprtype 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 for an electric car to transport 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).

4.1.3.4 Building 211/8 – HLW Storage Facility

The HLW storage facility is designed to store SF and solid RAW 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, about 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 concrete cask. 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 each pool is 300 FA. 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 box dimensions are 5.75 x 5.75 m and is 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 station for demineralized water of type MIX 1000 to produce and maintain the required quality of shielding water in the well, situated next to the entrance hall. The demi-water station area includes storage pool 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 processes 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 shielding 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,
- conductivity of shielding water in the SF pool , with an automatic startup of the demi-water station.

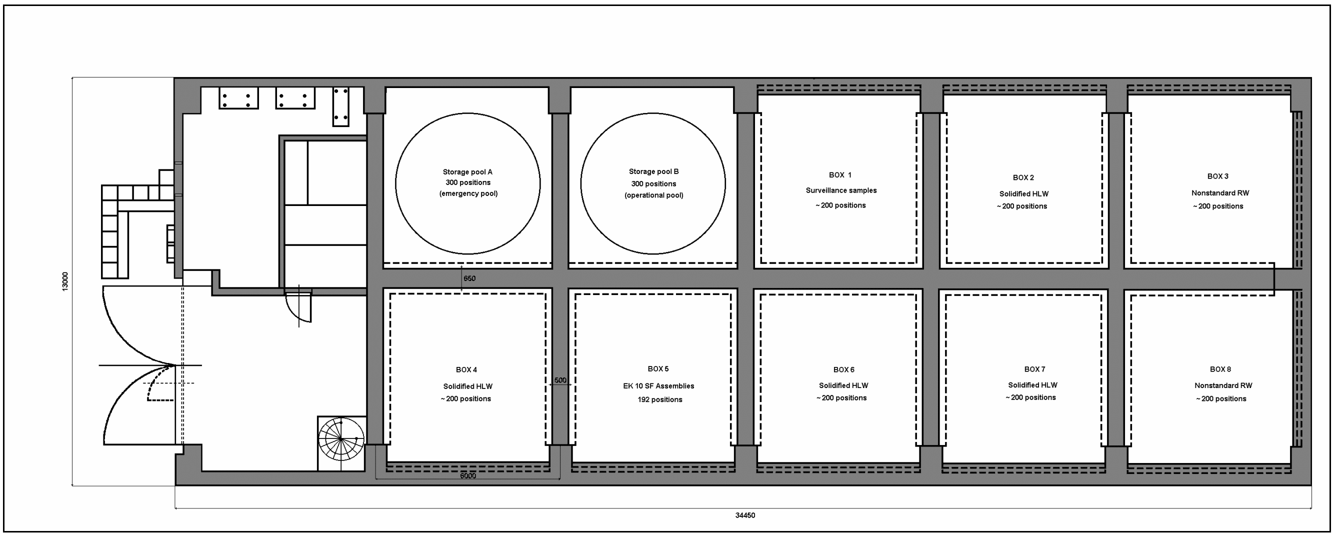

Fig. 4.5 Ground plan of the HLW storage

Light signaling of all these parameters is situated on a control panel in the storage hall. The signals are also put through 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.

As on 31 December 2002 the pool B contained 244 FA, from which 16 FA type EK–10 and 228 FA type IRT–2M (enriched to 80 % wt. ^{235}U). The thermal output of the FA amounted to 550.7 W as on the date of their placement into the pool B.

4.2 Inventory and Facilities for RAW Management

4.2.1 Nuclear Power Plant Dukovany

By the operation of NPP Dukovany liquid, solid and gaseous RAW are produced. Facilities for RAW management are listed (by the individual types of RAW) in the chapters below.

4.2.1.1 Solid RAW

4.2.1.1.1 Equipment for solid RAW treatment

- Low-level RAW

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

  - Controlled collection and primary segregating of solid RAW by the type is performed at stable assigned places (21 stable collection points and additional may be established on as needed basis, particularly during regular and general repairs of the units). Solid RAW with dose equivalent rate > 1mSv/h are stored in shielded boxes. The collection points are provided with PE bags and metallic casks for minor metallic waste. The collected waste is transported to BAPP,
  - Measuring and segregating of solid RAW – primary measuring and segregating of solid RAW based on their radioactivity is based on the waste type and dose rate equivalent in BAPP. Measuring is performed with hand-held devices (e.g. radiometer RP114) and segregating carousel.

  Solid RAW meeting criteria for release into the environment (with the dose equivalent rate below 1mSv/h) are segregated and subject to final authorized measuring they are released into the environment.

  Solid RAW that fail to meet the criterion (with the dose equivalent rate greater than 1mSv/h) are subsequently measured and segregated in a segregating box before the final authorized measuring and released into the environment.

  The remaining RAW that cannot be released to the environment is stored in an organized manner in box pallets with the volume 0.4 m^3 or, after low-pressure pressing (15 t) in 200 l galvanized drums in BAPP storage wells.

- 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 treatment and disposal will be addressed within decommissioning of NPP.

4.2.1.1.2 Equipment for treatment 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 treatment, at the moment only low-pressure pressing is available. Another technology to minimize the final volume of solid RAW was high-pressure pressing in 1996 (using a rented high-pressure press). Equipment to minimize volume and treat material that cannot be pressed is not at the moment available at NPP Dukovany.

- 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 Equipment 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 rooms sized 6 x 9 x 11 m. The room floors are at the level - 1,3 m. The rooms ceilings are roofed 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 rooms. 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 rooms:

  - 4 rooms are provided with built-in structures for palletization. The rooms are used for storage of segregated solid RAW in box pallets. Each room is covered with 8 monolith panels. The structure inside divides each room into 32 units (1 unit: 1206 x 860 mm). Each unit accommodated 20 pallets stacked on one another,
  - 1 room is designed to store spent air-conditioning filters. The room is divided into 48 units, each with a built-in steel structure 600 x 600 mm. Each unit is covered with a hermetic closure,
  - 3 rooms are kept as a reserve to store solid non-standard RAW, that are difficult to treat to fit into a box pallet. Each room has 6 openings covered with hermetic closures.

- Intermediate-level solid RAW

  Intermediate-level solid RAW are kept in the storage facility for the active items in the reactor hall (in the so-called "mogilnik") A,B314 and A,B101/1,2. The anticipated storage time is until the NPP dismantling.

4.2.1.2 Liquid RAW

4.2.1.2.1 Facilities to collect and treat liquid RAW

A system for collection (and storage) of liquid RAW (concentrates and sorbents) is used to collect liquid RAW produced in the process of cleaning and treatment of liquid radioactive media, and for their subsequent storage. The system removes mechanical impurities by sedimentation from the process wastewater before further treatment. The treatment consists of distillation, which produces condensate and distillation residue - radioactive concentrate. The condensate is subsequently cleaned on ion exchangers and recycled or a part of it is, after a radiochemical test, released into the environment. The radioactive concentrate is before further treatment stored in storage tanks in BAPP.

4.2.1.2.2 Facilities for conditioning of liquid RAW

Conditioning of radioactive concentrates into a form acceptable for RAW repository Dukovany is performed with bituminisation technology. Bitumen-based product is than deposited in 200 l galvanized drums in RAW repository Dukovany. At the moment, no treatment of radioactive sludges and ion exchangers is performed.

Fig. 4.6 View of a bituminisation line to condition liquid RAW

4.2.1.2.3 Facilities to store liquid RAW

A system for storage of liquid RAW consists of:

- Storage tanks for radioactive concentrate with the total volume 2680 m^3 (4 x 550 + 460m^3),
- Emergency tanks for radioactive concentrate with the volume of 460 m^3,
- Tanks for active sorbents with the volume of 460 m^3 each,
- Overflow tanks 60m^3, sedimentation tanks 460m^3 and wastewater tanks (3 x 250m^3),
- Pumps and auxiliary technology equipment.

Liquid RAW of the organic origin (oils) are stored in 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

Waste type	The maximum permitted quantity to be stored	The actually stored quantity
Liquid RAW – concentrates of active waters	5000 m^3	2628 m^3
Liquid RAW – degraded sorbents	460 m^3	382 m^3
Solid RAW total	1100 t	921.3 t
Treated RAW in drums stored in buildings 809 PS–48 ZRAO and in a temporary store next to the building 801/1–01 before transport for disposal	500 drums	7 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 treated 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 treatment of gaseous RAW results in solid RAW and gaseous medium meeting requirements for release of radionuclides into the environment.

4.2.2 Nuclear Power Plant Temelín

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

- Liquid radioactive media are treated in special treatment stations so that the treated water may be used again in the plant and separated radioactive materials may be treated and disposed. Liquid concentrates and saturated ion exchangers are temporarily stored in the tanks of the radioactive concentrates storage facility and from here transported for bituminisation in BAPP. By June 2002 226.5 m^3 of radioactive concentrate has been produced. From this volume 39.5 m^3 have been treated on the bituminisation line.
- Solid RAW are stored in storage facilities for solid RAW.
- The philosophy for gaseous RAW treatment is fairly simple: separation of radioactive materials from contaminated gasses by filtration.

Tab 4.2. Activity of gaseous effluences

Radionuclide	Activity A effective dose E Use of annual limit L	Year 2000	2001	2002
$^{89+90}$Sr	A [Bq]	$1.196x10^{5}$	$3.786x10^{5}$	$1.124x10^{5}$
	E [Sv]	$1.3x10^{-12}$	$1.45x10^{-11}$	$9x10^{-13}$
	L [%]	$3.3x10^{-6}$	$3.6x10^{-5}$	$2.3x10^{-6}$
^{131}I	A [Bq]	$1.547x10^{8}$	$1.58x10^{7}$	$1.063x10^{7}$
	E [Sv]	$2.073x10^{-10}$	$2.12x10^{-11}$	$1.42x10^{-11}$
	L [%]	$5.2x10^{-4}$	$5.3x10^{-5}$	$3.56x10^{-5}$
Noble gases	A [Bq]	$9.87x10^{12}$	$3.67x10^{12}$	$3.608x10^{12}$
	E [Sv]	$2.55x10^{-8}$	$6.2732x10^{-9}$	$6.231x10^{-9}$
	L [%]	$6.387x10^{-2}$	$1.568x10^{-2}$	$1.558x10^{-2}$
Aerosols	A [Bq]	$6.38x10^{7}$	$7.42x10^{7}$	$5.53x10^{7}$
	E [Sv]	$2.55x10^{-8}$	$6.2732x10^{-9}$	$3.7377x10^{-9}$
	L [%]	$1.057x10^{-2}$	$1.335x10^{-2}$	$9.344x10^{-3}$
^{3}H	A [Bq]	$2.455x10^{11}$	$1.862x10^{11}$	$9.26x10^{10}$
	E [Sv]	$1.276x10^{-10}$	$9.68x10^{-11}$	$4.82x10^{-11}$
	L [%]	$3.19x10^{-4}$	$2.42x10^{-4}$	$1.204x10^{-5}$
^{14}C	A [Bq]	$3.409x10^{11}$	$3.186x10^{11}$	$3.659x10^{11}$
	E [Sv]	$6.58x10^{-8}$	$6.15x10^{-8}$	$7.06x10^{-8}$
	L [%]	0.1645	0.1537	0.1765
Transuranium	A [Bq]	$2.05x10^{4}$	$1.76x10^{4}$	$3.26x10^{4}$
elements	E [Sv]	0.00	0.00	0.000
	L [%]	0.00	0.00	0.000
TOTAL	**D [Sv]**	**$9.591x10^{-8}$**	**$7.324x10^{-8}$**	**$8.0653x10^{-8}$**
TOTAL+II.O.	**D [Sv]**	**$9.591x10^{-8}$**	**$7.324x10^{-8}$**	**$8.0653x10^{-8}$**
TOTAL	**L [%]**	**0.2398**	**0.1831**	**0.2016**
Air	[mil.m^{3}]	9703	10108	9807

4.2.2.1 Solid RAW

Tab. 4.3 RAW produced from the beginning of operation to 31 December 2002

Year	Total	Low-pressure pressing		Bitumen-based product	
	[t]	[t]	[m^{3}]	[t]	[m^{3}]
2000	-	-	-	-	-
2001	0.5	-	-	-	-
2002	21.3	0.5	1.2	20.0	18
TOTAL	**21.8**	**0.5**	**1.2**	**20.0**	**18**

Note :

Data in the column „Total [t]" include all solid RAW with the dose rate > 1 μGy/hour. Under SÚJB Decree No. 307/2002 Coll., § 48 paragraph 4, this waste is classified as temporary radioactive and subsequently segregated as follows:

- non-active (release into the environment , dump site SIII Temelínec)
- radioactive (low-pressure pressing into 200 l drums, deposited into RAW repository)
- solidified liquid RAW fixed in bitumen.

Tab. 4.4 Activity fixed in a bitumen-based product as on 31 December 2002

Radionuclide		Half-life	Activity [Bq]
Radionuclides with established limits	^{14}C	5 730 y	2.78×10^{6}
	^{41}Ca	100 000 y	5.25×10^{4}
	^{59}Ni	75 000 y	3.17×10^{5}
	^{63}Ni	92 y	1.30×10^{6}
	^{90}Sr	27.7 y	5.70×10^{4}
	^{94}Nb	20 000 y	5.38×10^{5}
	^{99}Tc	212 000 y	4.79×10^{5}
	^{129}I	17 200 000 y	4.66×10^{4}
	^{137}Cs	30 y	5.79×10^{6}
	^{239}Pu	24 390 y	2.54×10^{3}
	^{241}Am	458 y	2.54×10^{3}
Radionuclides without established limits	^{42}K	12 h	1.95×10^{6}
	^{51}Cr	28 d	2.72×10^{6}
	^{54}Mn	303 d	2.19×10^{7}
	^{58}Co	72 d	6.81×10^{6}
	^{60}Co	5,26 y	1.54×10^{6}
	^{124}Sb	61 d	3.76×10^{9}
Total activity	Beta		3.98×10^{9}
	Gamma		9.11×10^{9}
	Alpha		1.17×10^{6}
Number of drums			90 pieces
Stored weight			20 137 kg

4.2.2.2 Gaseous RAW

The following table lists activities of gaseous effluences, effective doses caused by them to an individual from a critical group of population and contributions of individual radionuclides groups to the drawing on the established limit for gaseous effluences, for the period from NPP commissioning to 31 December 2002:

Tab. 4.5 Activity of gaseous effluences

		Year		
Radionuclide	**Activity/ Effective dose**	**2000**	**2001**	**2002**
$^{89+90}$Sr	A [kBq]	0.00	0.00	0.00
	E [μSv]	0.00	0.00	0.00
Iodine	A [MBq]	0.00	1.1280	0.2098
	E [μSv]	0.00	0.00	0.00
Noble gases	A [GBq]	52.479	5 278.6838	3 027.7516
	E [μSv]	0.00	0.0440	0.0493
Aerosols	A [kBq]	0.00	122.5584	47.8068
	E [μSv]	0.00	0.00	0.00
^{3}H	A [GBq]	0.481	21.0647	14.6073
	E [μSv]	0.00	0.00	0.00
^{14}C	A [GBq]	1.174	21.2929	26.8039
	E [μSv]	0.00	0.0066	0.0083
Transuranium elements	A [kBq]	-	6.3241	2.7105
	E [μSv]	-	0.00	0.00
TOTAL	**D [μSv]**	**0.001**	**0.0506**	**0.0576**
TOTAL+II.O.	**D [μSv]**	**0.001**	**0.0506**	**0.0576**
Air	[mil.m^{3}]	1 265.527	4 521.2823	1 224.9491

Tab. 4.6 Contributions by individual radionuclides groups to drawing on limits for total annual effluences

	Year		
Radionuclide	**2000**	**2001**	**2002**
$^{89+90}$**Sr**	0.000 %	0.0000 %	0.0000 %
RI	0.000 %	0.0000 %	0.0000 %
Noble gases	0.000 %	0.1100 %	0.5156 %
Aerosols	0.000 %	0.0000 %	0.0000 %
Tritium	0.000 %	0.0000 %	0.0001 %
^{14}**C**	0.000 %	0.0164 %	0.0449 %
Transuranium elements	0.000 %	0.0001 %	0.0001 %
TOTAL	**0.000 %**	**0.1266 %**	**0.5606 %**
TOTAL+II.O.	**0.000 %**	**0.1266 %**	**0.5606 %**
% of the annual discharge limit :	0.000 %	0.13 %	0.56 %

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/y. This limit is based on the optimized limit set in § 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

This repository is used to dispose RAW of institutional origin with artificial radionuclides.

Tab. 4.7 Inventory of RAW repository Richard

Radionuclide	**Total activity** [Bq]
^{3}**H**	5.00×10^{13}
^{14}**C**	7.22×10^{12}
^{90}**Sr**	3.25×10^{12}
^{137}**Cs**	4.2×10^{14}
Alpha	1.4×10^{13}

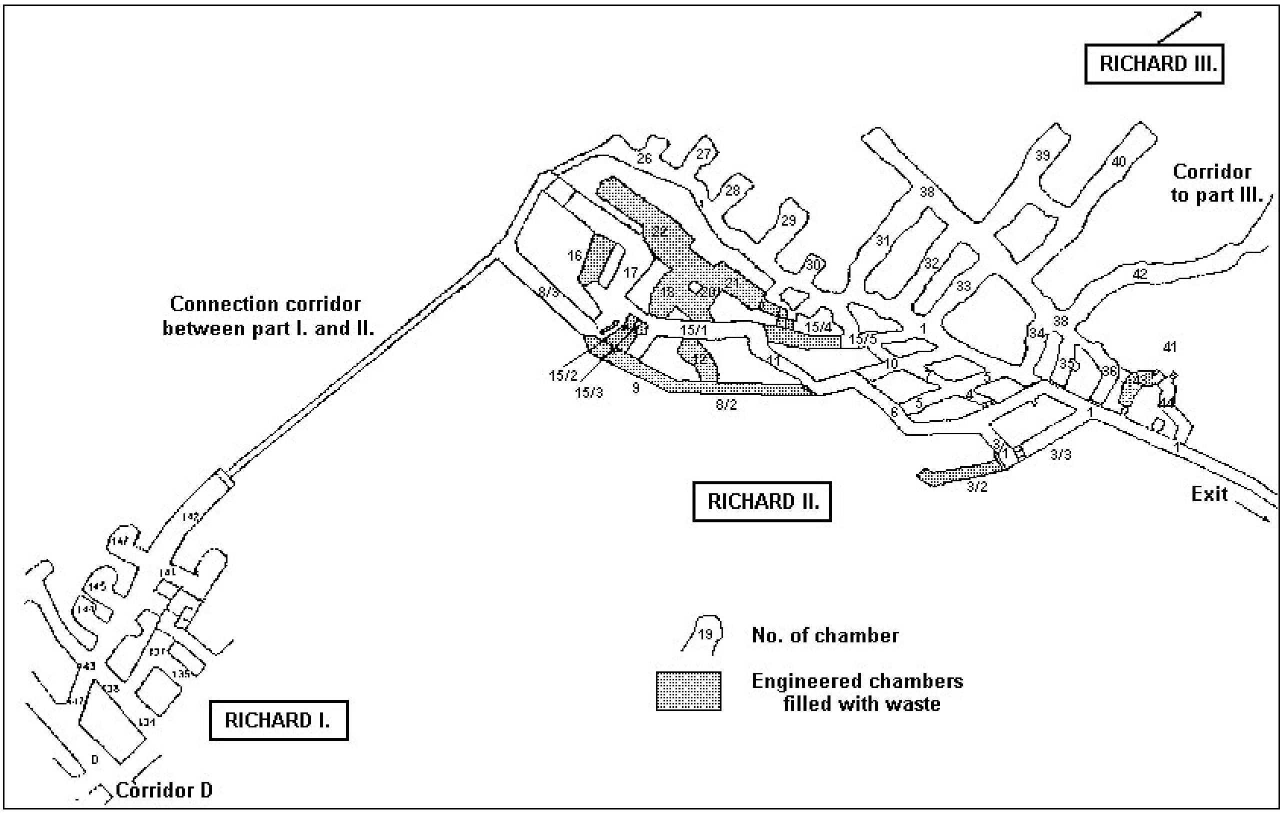

Fig. 4.7 RAW repository Richard – cross section

4.2.3.2 Repository Bratrství

The repository is used to dispose RAW of institutional origin with natural radionuclides.

Tab. 4.8 Inventory of the repository Bratrství

Radionuclide	Total activity [Bq]
^{226}Ra	8.71x10^{11} Bq
^{238}U	2.96x10^{11} Bq
^{235}U	1.80x10^{10} Bq
^{234}U	1.42x10^{10} Bq
^{232}Th	1.78x10^{8} Bq
^{210}Po	2.00x10^{6} Bq

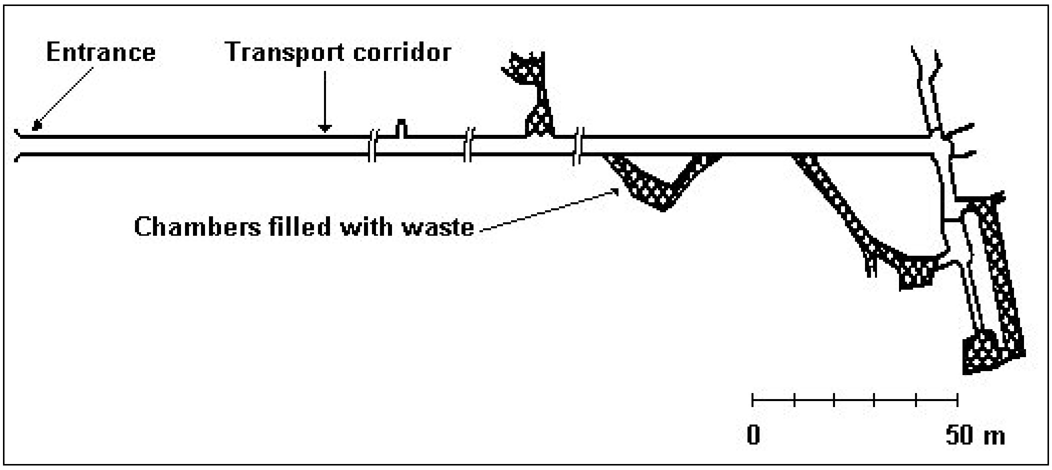

Fig. 4.8 Repository Bratrství – cross-section

4.2.3.3 RAW Repository Dukovany

The repository is used to dispose short-lived and low-level RAW from NPP.

Tab. 4.9 Inventory of the RAW repository Dukovany

Radionuclide	**Total activity** [Bq]	**Radionuclide**	**Total activity** [Bq]
^{14}C	7.87×10^{9}	**^{99}Tc**	1.17×10^{9}
^{41}Ca	7.64×10^{7}	**^{129}I**	3.62×10^{8}
^{59}Ni	1.07×10^{9}	**^{137}Cs**	2.19×10^{11}
^{63}Ni	2.30×10^{10}	**^{239}Pu**	2.59×10^{6}
^{90}Sr	1.94×10^{9}	**^{241}Am**	5.16×10^{6}
^{94}Nb	9.12×10^{8}		

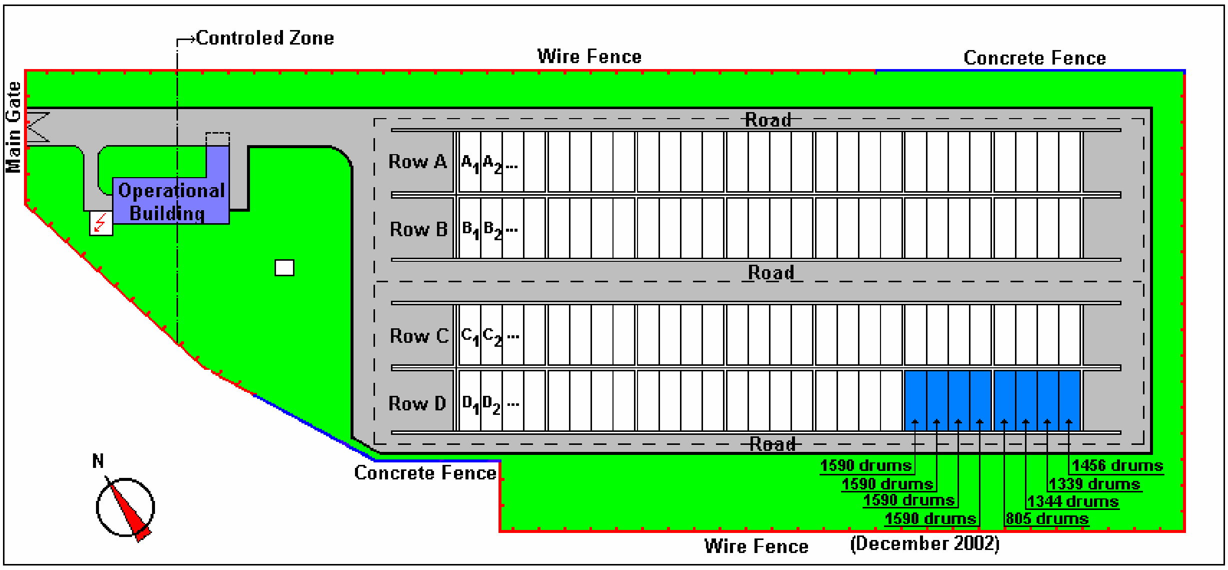

Fig. 4.8 Ground plan and current filling status in the vaults in RAW repository Dukovany

4.2.3.4 RAW Repository Hostím

The repository has been closed; in the past it was used to dispose RAW of institutional origin.

Tab. 4.10 Inventory of the RAW repository Hostím

Activity converted as in 1991	Estimate: equivalent of gallery A, max. 10^{10} Bq (range of radionuclides produced in ÚJF)	About 10^{11} Bq (mostly ^{137}Cs, ^{90}Sr, ^{3}H, ^{14}C)

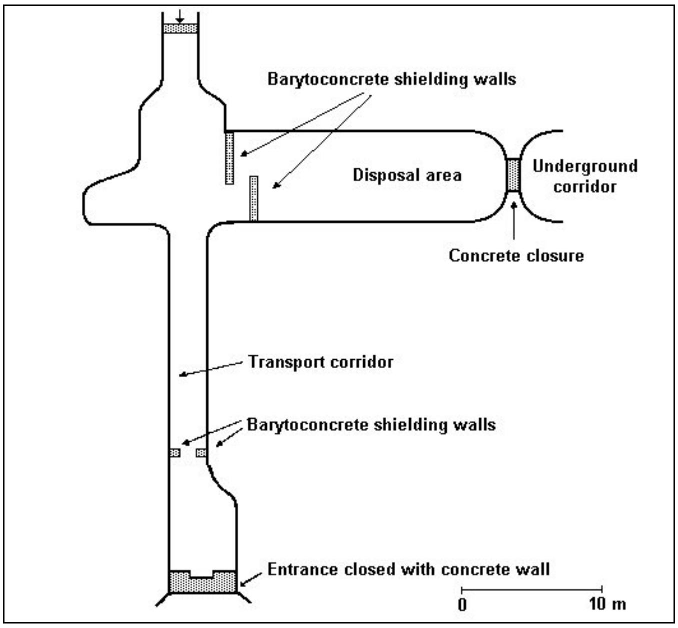

Fig. 4.9 RAW repository Hostím – cross section

4.2.4 ÚJV Řež a. s.

4.2.4.1 Building 241 – RAW Management Facility Velké zbytky

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

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

Volume of liquid RAW [m^3]	Volume of solid RAW [m^3]
83	2.4

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

Volume of liquid RAW [m^3]	**Volume of solid RAW** [m^3]
25	5

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 (spent sealed radionuclide source), 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]
I.	0.02
II.	6.80
Total	**6.82**

The estimated total activity of the stored RAW is 1.75 MBq (isotopes $^{235,\,238}$U), 29.3 GBq ^{239}Pu, 11.6 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)	228	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 cask	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 – Article 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 licence;*
   - *(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 licences;*
   - *(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 Forming the Legislative and Regulatory Framework

The legislative and regulatory framework in nuclear power industry has had a relatively long history in the Czech Republic. It beginnings date back to the second half of 1970s and are associated with the development and operation of the first nuclear power plants with VVER reactors in former Czechoslovakia.

The legislative process governing industrial utilization of nuclear energy started with an amendment to the Act No. 50/1976 Coll., on land planning and building regulations (Building Act), and its implementing Decrees No. 83/1976 Coll., on construction project documentation and No. 85/1976 Coll., on more details of the land planning and building regulations. The Building Act of 1976 for the first time in a binding manner established that implementation of construction projects containing NI required a special approval from the then ČSKAE. Decree

No. 85/1976 Coll. defined types and content of safety reports on which ČSKAE based its approvals to build nuclear installations:

- Initial safety report – to obtain the planning and zoning and planning decision,
- Preliminary safety report – to obtain the building permit,
- Pre-operational safety report – for approval of the installation's commissioning.

Decree No. 83/1976 Coll. established that these three types of safety reports should be an integral part of documents for construction projects containing nuclear installations.

In 1978 – 1980 ČSKAE in connection with the above-mentioned decrees issued the following fundamental legally binding regulations:

- ČSKAE Edict No. 2/1978 Coll., on nuclear safety assurance in designing, licensing and implementation of constructions with nuclear power installations, which established technical requirements and safety criteria for nuclear power plants designs,
- ČSKAE Edict No. 4/1979 Coll., on general criteria for nuclear safety assurance for constructions with nuclear power installations, which established conditional and eliminating criteria for siting of nuclear power plants,
- ČSKAE Edict No. 5/1979 Coll., on quality assurance of selected equipment in nuclear power industry from the viewpoint of nuclear safety, which introduced a quality assurance system for activities and components important from the viewpoint of nuclear safety,
- ČSKAE Edict No. 6/1980 Coll., on nuclear safety assurance during commissioning and operation of nuclear power installations, which defined individual stages of nuclear installation commissioning and specified documents and requirements necessary to issue a permit to move to the next stage.

This first stage of formation of the legislative framework for nuclear safety assurance in Czechoslovakia was completed in 1984 with the issuance of Act No. 28/1984 Coll., on state nuclear safety supervision of nuclear installations. The body assigned by the Act to perform the state supervision was the then ČSKAE – a body independent of manufacturers of NI and their operators. The Act No. 28/1984 Coll. defined some significant basic terms:

- *nuclear safety – the condition and ability of a nuclear installation and its servicing personnel to prevent the uncontrolled development of a fission chain reaction or an inadmissible release of radioactive substances or ionizing radiation into the environment,*
- *nuclear installation - construction and operating units containing a nuclear reactor or facilities for storage, treatment, disposal and transport of radioactive waste; fresh fuel and spent radioactive fuel,*
- *responsible organization – organization providing for construction and operation of a nuclear installation or transport of radioactive wastes and nuclear materials*."

Act No. 28/1984 Coll. for the first time established that responsibility for nuclear safety of a NI as a whole should be born by the investor or operator (responsible organization).

The above-mentioned act and other legal regulations specified basic requirements for nuclear safety and rules to execute state supervision, including definition of its powers, e.g. power to approve limits and conditions for safe operation, startup programs, quality assurance programs, as well as the power to verify professional competence of selected personnel at nuclear installations. The act also established sanctions (fines) for its violations or endangering of nuclear safety and also the power to order that the output of a NI is reduced or stop its operation in case there is a danger in delay.

Act No. 28/1984 Coll. and related legal regulations at their time represented significant modern tools to manage nuclear safety that in the former Czechoslovakia contributed to its new quality and standards, comparable with the worldwide practices and particularly recommendations by IAEA.

The basic legislative framework was complemented with a number of other regulations:

- Decree by the Ministry of Health No. 59/1972 Coll., on health protection against ionizing radiation,
- ČSKAE Decree No. 28/1977 Coll., on accounting for and control of nuclear materials,
- ČSKAE Edict No. 8/1981 Coll., on testing of equipment for shipment and storage of radioactive materials,
- ČSKAE Edict No. 9/1985 Coll., on nuclear safety assurance for nuclear research installations, which established technical and organizational requirements for nuclear safety of research reactors,
- ČSKAE Decree No. 67/1987 Coll., on nuclear safety assurance in radioactive waste management, which defined requirements for systems and activities associated with collection, segregating, treatment, treatment, storage and disposal of radioactive wastes from nuclear installations,
- ČSKAE Decree No. 100/1989 Coll., on physical protection of nuclear installations and of nuclear materials, which introduced into the legislative framework requirements resulting from the Convention on Physical Protection of Nuclear Materials
- ČSKAE Decree No. 191/1989 Coll., establishing methods, terms and conditions for verification of special professional competence of selected personnel at nuclear installations, which defined requirements for professional competence of control room personnel in nuclear installation (operators),
- ČSKAE Decree No. 436/1990 Coll., on quality assurance of selected equipment with regard to nuclear safety of nuclear installations, which represented an amended ČSKAE No. Edict 5/1979 Coll.
- Decree No. 76/1989 Coll., by ČÚBP (Czech Institute for Labor Safety) on safety assurance of technical equipment in nuclear energy industry.

5.2.2 Currently Valid Legislation in the Area of Utilization of Nuclear Energy and Ionizing Radiation

A completely new stage of state supervision development is associated with the founding of the independent Czech Republic. The Act No. 21/1993 Coll. of 21 December 1992 established the State Office for Nuclear Safety which in the Czech Republic replaced the formed ČSKAE in terms of execution of state supervision of nuclear safety from 1 January 1993. The Office was granted additional powers by Act No. 287/1993 Coll., on SÚJB competence and Act No. 85/1995 Coll. (these have been repealed by the Atomic Act No. 18/1997 Coll. – see 5.3.1).

Simultaneously with the founding of the independent Czech Republic, works started on a new act to comprehensively cover utilization of nuclear energy and ionizing radiation, particularly in respect to some issues not sufficiently addressed, e.g. RAW management, responsibility for potential nuclear damages, emergency preparedness etc.

The Chamber of Deputies of the Czech Parliament approved the new Atomic Act No. 18/1997 Coll. in January 1997. The Act entrusted execution of state administration and supervision of utilization of nuclear energy and radiation practices to SÚJB and newly defined its competence.

The Atomic Act newly defines conditions for peaceful utilization of nuclear energy and ionizing radiation, including activities requiring a licence from SÚJB. An extensive list of obligations of the licencees also includes the obligations concerning their preparedness for occurrence of a radiation accident.

In respect to RAW management the Act assigns responsibility for final disposal of all RAW to the state and charges the Ministry of the Industry and Trade of the Czech Republic to establish a new state agency for the purpose – SÚRAO. Activities performed by the Authority are funded from the so-called nuclear account, whose income comes basically from generators of RAW.

The Atomic Act transfers into the Czech legal system a number of obligations resulting from the Vienna Convention on Civil Liability for Nuclear Damage and Joint Protocol relating to the Application of the Vienna and Paris Conventions, to which the Czech Republic had acceded.

The Atomic Act should be considered a very significant dividing line in the development of the Czech legislation. It declared invalid and replaced the hitherto valid legislation and at the same time authorized SÚJB, and in some specific cases also other state administration bodies, to issue a set of related implementing regulations. (see 12.6.1.1.2). The regulations are:

- 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,
- 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 issuance of authorizations to selected personnel, and the form of documentation to be approved for licensing of training of selected personnel,
- 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. 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,
- 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 selected 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,
- 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,
- Decree SÚJB No. 196/1999 Coll., on decommissioning of nuclear installations or workplaces with significant or very significant sources of ionizing radiation,
- Decree SÚJB No. 324/1999 Coll., establishing concentration and quantity limits of nuclear materials not subject to provisions about nuclear damages.

An important legislative step has been adoption of the so-called "crisis acts" in 2000. They include:

- Act No. 239/2000 Coll., on 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 the crisis conditions and alterations in some acts.

The acts came into effect on 1 January 2001, they govern one of the areas directly related to nuclear safety and are fully compatible with the EU law.

Implementation of the Atomic Act is also assured through the following binding regulations:

- Decree No. 328/2001 Coll. issued by the Ministry of the Interior on some details of integrated rescue system assurance,
- Decree No. 360/2002 Coll. issued by the Ministry of the Industry and Trade, establishing creation of a reserve for decommissioning of nuclear installations or workplaces in categories III or IV,
- 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,
- Government Order No. 11/1999 Coll., on emergency planning zone,
- Non-registered ministerial regulation (issued by the Ministry of the Industry and Trade, No. 9/1997) defining the statute of SÚRAO.

In connection with the country's preparation to EU accession and in order to enable implementation of obligations resulting from the newly concluded international treaties, the Czech Republic's Parliament amended the Atomic Act as Act No. 13/2002 Coll. The amended provisions include particularly those concerning radiation protection in order to assure compatibility with the respective European Directives and parts concerning guarantees that accept the supplementary protocol to the Nuclear Weapons Non-proliferation Treaty.

In connection with the changes in the Atomic Act (as amended by Act No. 13/2002 Coll.) some related implementing regulations have been also changed or amended:

- Decree No. 178/2002 Coll., establishing a list of selected items and items of dual use in the nuclear area (revoking Decree No. 147/1997 Coll.),

- Decree No. 307/2002 Coll., on radiation protection (the decree also includes requirements for safe radioactive waste management; revoking Decree No. 184/1997 Coll.),
- 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 (revoking Decrees No. 142/1997 Coll. and No. 143/1997 Coll.),
- 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 (revoking Decree No. 219/1997 Coll.),
- Decree No. 319/2002 Coll., on function and organization of the national radiation monitoring network,
- 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 competency and issuance 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.

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's government and IAEA on claiming of guarantees based on the Nuclear weapons non-proliferation treaty. Ratification of the Supplementary Protocol thereto is performed simultaneously with the legislative framework changes,
- 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 SF management and on the safety of radioactive waste management

In addition to the above-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 Czech 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 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 Republic and government of the Republic of Hungary on regulation of the issues of mutual interest related to nuclear safety and radiation protection,
- Agreement between government of the Czech Republic and government of the Slovak Republic on regulation of the issues of mutual interest related to nuclear safety and radiation protection,

A similar agreement with the Republic of Poland is being negotiated.

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“.

5.2.3 Approval Process, Inspections and Enforcement of Compliance with Regulations

The basic legal regulations governing the licensing and approval process for NI are the above-mentioned Building 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 environmental impact assessment and Act No. 106/1999 Coll., on free access to information, as well as other related lower legal regulations.

From the viewpoint of the Building Act, there are four fundamental decisions for any construction with a nuclear installation, i.e. zoning and planning decision, building permit decision, building inspectors approval (for permanent operation) and decision on construction removal, within the competence of local authorities, specifically the locally relevant building 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 approval from relevant state administration bodies which defend such interests. The relevant state administration body may make its approval 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,
- Locally responsible offices
  - in respect to fire safety,

- in respect to fire safety 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 § 126 paragraph 3 the Building Act establishes that a building department, before issuing a zoning and planning decision, building permit or any other additional permit concerning a construction which includes a nuclear installation, shall request the applicant to submit a licence issued by SÚJB under the Atomic Act. Pursuant to the Building Act the building department shall not issue any decision or permit without the licence.

The Atomic Act specifies activities requiring a licence 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 NI commissioning, refurbishment or other changes affecting nuclear safety, radiation protection, physical protection and emergency preparedness, introduction 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 environment impact assessment and alterations in some related acts (Environment Impact Assessment Act), 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 § 39 of the Atomic Act and also by Act No. 552/1991 Coll., on state inspection, as enacted by Act No. 166/1993 Coll.

Remedial measures to meet legislative requirements are specified in § 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 NI 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. § 16 of the Atomic Act, and particularly its paragraph 4, deals with alteration, cancellation and cessation of a licence, which entitles SÚJB to reduce or suspend the licenced activity, provided the licencee 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

The Czech National Council established SÚJB on 21 December 1992 by Act No. 21/1993 Coll. issued. In agreement therewith SÚJB after cessation of ČSFR assumed functions of the former ČSKAE in performance of state supervision of nuclear safety and nuclear materials. The action confirmed the independent regulatory body within the constitutional framework, which defines execution of state administration in the Czech Republic. The competence of SÚJB has been established by Act No. 287/1993 Coll., on competence of the State Office for Nuclear Safety and related regulations. In July 1995 the Czech Parliament passed a resolution to extend competence of SÚJB to include protection against ionizing radiation (Act No. 85/1995 Coll., of 19 April 1995 in effect since 1 July 1995). As a result, the regulatory bodies in charge of nuclear safety and radiation protection in the Czech Republic have been merged. SÚJB has thus become an integrated state administration body carrying out supervision in the entire area of utilization of nuclear energy and ionizing radiation.

At the moment the competence of SÚJB is defined by the Atomic Act, § 3 which states the following:

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

(2) *The Office*

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

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

c) *shall issue licences 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 licencees, 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 licencees, 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;*

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

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

t) *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;*

u) *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;*

v) *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 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 Rights and Responsibilities of the Regulatory Body

§ 9 paragraph 1 of the Atomic Act establishes the following conditions for utilization of nuclear energy and ionizing radiation:

" A licence 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 licence 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 treatment 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;*
- r) *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;*
- s) *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 licence issuance (§ 10),
- probity and professional competence of the applicant for a licence (§ 11 a § 12),
- content and particulars of the licence application (§ 13),
- SÚJB conduct in the administrative proceedings (§ 14),
- requisites of the licence (§ 15),
- alteration, cancellation and cessation of the licence (§ 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 (Article 39),
- remedial measures (Article 40),
- penalties (Articles 41 and 42).

The Atomic Act, together with Act No. 552/1991 Coll., on state inspection and monitoring, as enacted by Act No. 166/1993 Coll., 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 licencees under the quoted § 9 paragraph 1. SÚJB supervisory activities are in detail described in § 39 paragraph 1 of the Atomic Act.

SÚJB personnel performing the supervision are inspectors of nuclear safety or radiation protection and SÚJB Chairperson appoints them. They work at the SÚJB headquarter, at the NPPs 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 identifies 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 radioactive waste, 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 Article 41 and in compliance with the rules specified in Article 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 is an independent central state administration body for the area of nuclear safety and radiation protection. It has its own budget 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 jobs approved in the SÚJB budget for 2003 is 197, while approximately 2/3 of the number are inspectors of nuclear safety and inspectors of radiation protection. The SÚJB budget for 2003 is approximately 356 million Czech crowns. 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 Nuclear Materials
- Section of radiation protection which includes Department of Exposure Regulation, Department of Radiation Sources and Department Radiation Protection in Fuel Cycle and Department of Assessment of Radiation Protection Activities
- Section of management and technical support which includes Department of International Cooperation, Department of Financial Management and Administration, Office Bureau (legal

matters, personnel training, science and research coordination etc.) and Department for Control of Ban of Chemical and Biological Weapons

- Independent Department of Emergency Preparedness and Emergency Management, Emergency Response Center (reporting directly to the SÚJB Chairman)
- Independent department to coordinate activities associated with the accession to the European union (reporting directly to the SÚJB Chairman)
- QA management department
- Advisory bodies to the Office Chairperson,
- Regional SÚJB centers in Prague, Pilsen, České Budějovice, Ústí nad Labem, Hradec Králové, Brno and Ostrava subordinated to the radiation protection section,
- Detached workplaces of the nuclear safety section at both the NPPs (Dukovany, Temelín) subordinated to the nuclear safety section.

SÚJB is also a managing authority for SÚRO, fully funded from the state budget, which provides professional and technical support in the field of radiation protection and for SÚJCHBO, partly funded from the state budget, which provides primary professional and technical support to SÚJB in the field of chemical, biological and radiation protection.

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 – carry out the state supervision of nuclear safety, radiation protection, physical protection and emergency preparedness. Meanwhile, the SÚJB competences 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. In the first case the reduced inspection mission focused particularly on SÚJB activities in respect to the licensing process at NPP Temelín. The inspection team closed the mission with the following conclusions:

- There is a clearly defined legislative framework in place for NPP Temelín licensing process and SÚJB issues permits for each of the defined key stages throughout all stages of the plant's construction and acceptance,

- SÚJB specified requirements for the state supervision in respect to the level of nuclear safety assurance at NPP Temelín and adopted a flexible approach to make sure that the adopted criteria of the inspections and evaluations will be met,
- SÚJB has a previously established plan of inspections which the inspectors use to check and confirm that the licencee is commissioning the nuclear power plant in agreement with the conditions contained in the respective permits,
- Experience and assistance of the regulatory bodies from West Europe and USA have been used to develop an adequate system of state supervision during authorization, surveillance, evaluation and inspections of NPP Temelín.

The mission team members provided SÚJB with several recommendations whose implementation may result in further improvement in the state supervision performance. All proposals and recommendations concerned a long-term development of the organization and were based on the current methodological procedures and achieved results.

The second mission in full scope reviewed the status of performance of state supervision of peaceful utilization of nuclear energy and ionizing radiation. Twelve experts from nine countries inspected all aspects of supervisory activities performed by the state in this field to be provided for by SÚJB under the law, including supervision of nuclear safety, radiation protection, RAW management, emergency preparedness and transport of radioactive materials.

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-term development of the organization. Reports from both the IRRT missions have been published on the SÚJB website.

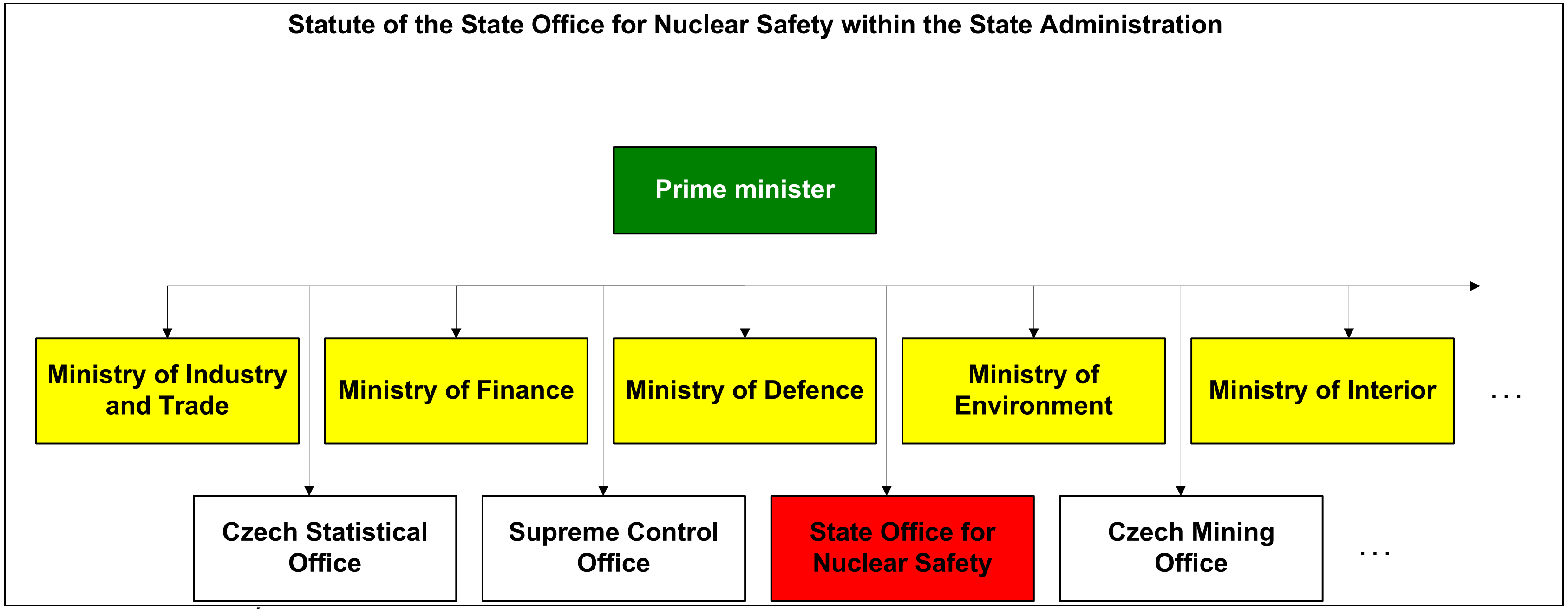

Fig. 5.1 Position of SÚJB within the state administration structure

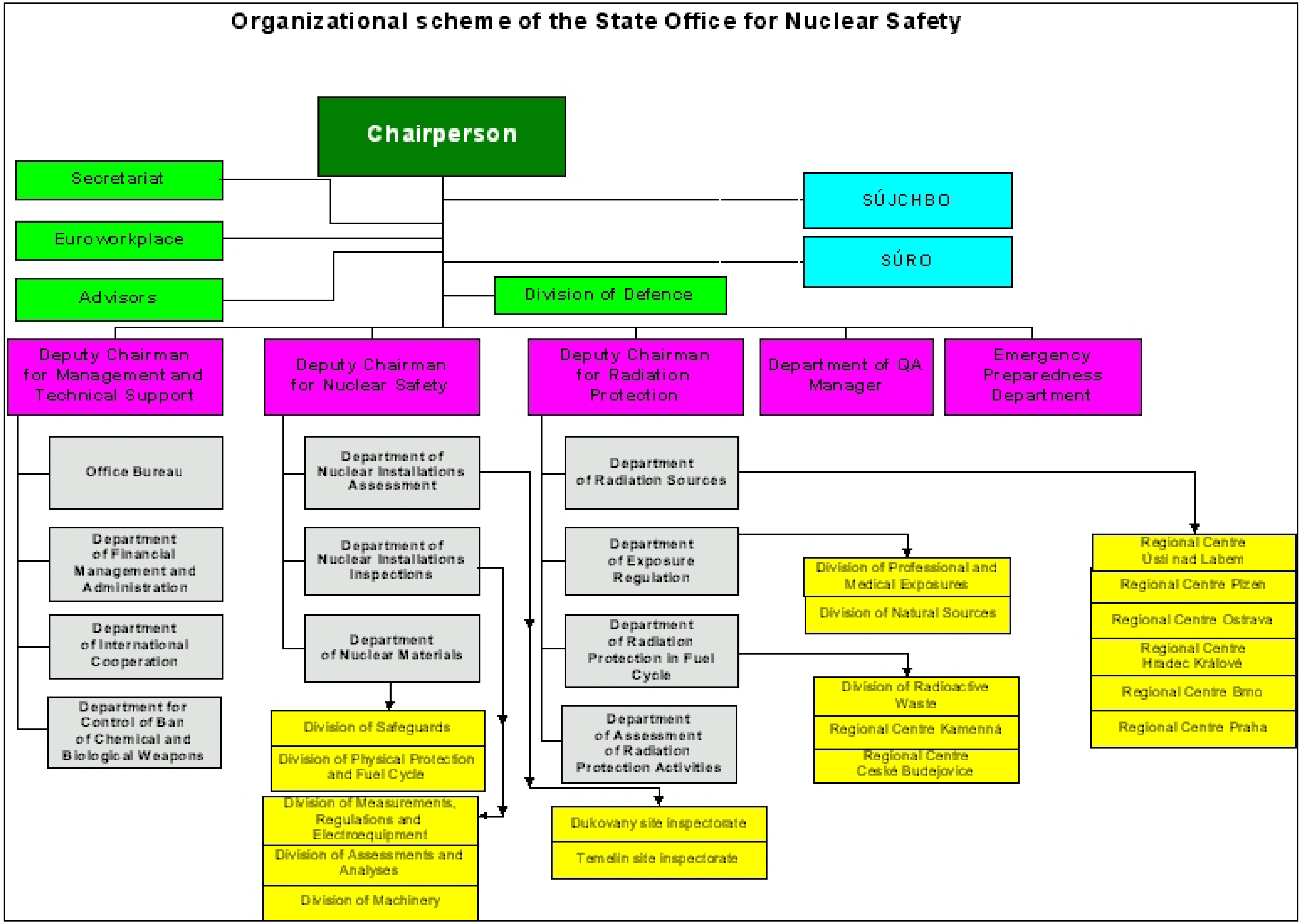

Fig. 5.2 SÚJB Scheme

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

6.1 Responsibility of the Licencee

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 licence and shall take the appropriate steps to ensure that each such licencee meets its responsibility.

2. If there is no such licencee or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.

An explicit statement of liability on the part of the Licencee's for nuclear safety of its respective nuclear installation as a whole was declared under Act No. 28/1984 Coll. on state nuclear safety supervision of nuclear installations.

The present law was elaborated on this basic principle to specify a number of partial responsibilities of the Licencee that would constitute the aggregate liability for nuclear safety. Those specific responsibilities are mainly discussed under § 17 a § 18 of the Atomic Act where the Licencee 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 Licencee, e.g.

- Review and maintain systematically the nuclear safety and radiation protection to follow the state-of-the-art;
- Observe the technical or organizational terms of safe operation, licence terms and conditions, and the approved quality assurance programs;
- Investigate promptly any breach of these terms and conditions followed by corrective actions taken 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 inspectors of nuclear safety and radiation protection are specified under § 39 paragraph 4, letters b), c) of the Atomic Act. In compliance with this law, the inspectors shall control 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 the Technical Specifications and the operating procedures to demand evidence in respect to fulfillment of the specified obligations.

The joint-stock company ČEZ, a. s. as the holder of licence for operation of NPP Dukovany and NPP Temelín, SÚRAO and ÚJV Řež a. s. hold the primary responsibility for nuclear safety and radiation protection of their NI 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 Licencee 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 Licencee 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 Licencee also include the sole and absolute liability for nuclear damage due to operation of the nuclear installation (see § 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 § 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 licencee.

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."

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

Each licencee authorized to operate a NI or a Category III and IV workplace shall be obligated under § 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*

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

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 licencee 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 decommission technique details are specified under the Decree No. 360/2002 Coll. of the Ministry of Industry and Trade which stipulates the method for creating the provision / monetary reserve for decommissioning of NI. The method for creating the financial reserve for regulatory supervision following shutdown of repositories is amended under the Czech government Order No. 416/2002 Coll. which stipulates the amount and method of payment to the nuclear account of the generator of radioactive waste, and the annual contribution paid to municipalities, including the rules for allowance.

6.2.1 ČEZ, a. s.

The responsibility for nuclear safety and radiation protection of the NI 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 nuclear energy division who reports to the Managing Director in respect to nuclear safety and radiation protection assurance of the NI within his responsibility.

The process of training and qualifications prescribed for the ČEZ, a. s. 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, a. s. 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.

The statutory reserve for decommissioning of NPP Dukovany as created by ČEZ, a. s. amounts to CZK 650 mil. per year. The provision for decommissioning of NPP Temelín amounts to CZK 370.667 mil. per year.

The state organization of SÚRAO shall inspect and verify that decommissioning reserves are created for nuclear installations.

[1a] § 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.

By internal decision, ČEZ, a. s. shall even create a provision for SF storage. This reserve is funded from the corporate proceeds and intended to cover the cost incurred to ČEZ by storage of spent fuel, even upon decommissioning of nuclear units.

By the 30 June 2002, the power utility of ČEZ, a. s. provided the following amounts:

- CZK 3.059 billion paid to the nuclear account;
- CZK 3.585 billion available as the monetary reserve for decommission of nuclear installations (of that, the decommissioning provision for NPP Dukovany is CZK 3.250 billion);
- CZK 5.382 billion available as the internal reserve for SF storage.

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 terms – 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 June 2002, ÚJV Řež a.s. created the decommissioning reserve of CZK 48.777.000 and of that the HLW Storage provision amounts to CZK 728.000 per year.

The SF and RAW disposal are supported with a sufficient number of the qualified personnel.

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 § 18, Par. 1, Item h) of the Atomic Act. The Czech Government authorizes the SÚRAO budget, as part of the national budget. The practices under the authority of SÚRAO are supported with a sufficient number of the qualified personnel.

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

6.3.1.1.1 History of Law

As early as 1979, the former ČSKAE issued Edict No. 5/1979 Coll., on the quality assurance for nuclear safety of the selected equipment within the nuclear industry. This regulation was the initial document, which specified the basic requirements for development, approval, implementation and supervision of quality assurance programs as well as the associated nuclear safety, oriented planning, designing, manufacturing, installation, start-up, or operational activities for nuclear installations. The Edict No. 5/1979 Coll. also established the rules for nuclear safety oriented equipment classification within the nuclear industry. Since it was issued, the requirements of Edict No. 5/1979 Coll. have been successively implemented into construction of nuclear installations.

The Act No. 28/1984 Coll. on state nuclear safety supervision of nuclear installations then set forth the liability of the organization responsible for construction or operation of a NI to submit its quality assurance programs to the regulatory body for approval, and generally defined performance of supervision for implementation.

The original Edict No. 5/1979 Coll. was revised in 1990. The new ČSKAE Decree No. 436/1990 Coll., on the quality assurance of selected equipment with regard to nuclear safety of nuclear installations, always on the basis of the original Edict No. 5/1979 Coll. laid down the requirements for quality assurance of the selected equipment at each stage within the lifetime of a nuclear installation, including those for the quality assurance documentation.

The quality assurance process for SF storage and transportation within the management of RAW produced from NI was addressed by the consequent law – Decrees amending on the Act 28/1994 Coll., and IAEA recommendations, or the Decree No. 59/1972 Coll. by the Ministry of Health of the Czech Socialist Republic, on health protection from ionizing radiation, for other RAW.

6.3.1.1.2 Present Law

The Act No. 18/1997 Coll. on peaceful utilization of nuclear energy and ionizing radiation (the Atomic Act) and on amendments and alterations to some acts, as currently in force (hereinafter the Atomic Act) newly revised the general conditions for performance of practices related to nuclear energy utilization, radiation practices, and interventions to reduce exposure. The quoted Act, § 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 selected 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 selected 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 selected equipment with regard to their safety classification;
- Requirements for the contents of quality assurance program;
- Safety classification and breakdown criteria for the selected equipment,
- Scope and method to prepare the list of selected equipment.

As stated in SÚJB Decree No. 214/1997 Coll., § 2 , paragraphs 2 and 3, for siting and construction of a nuclear installation, or a workplace with a very important source of ionizing radiation, commissioning or operation of a nuclear installation, or a workplace with a very important source of ionizing radiation, or handling of RAW from nuclear installations, the quality assurance system shall be implemented in the scope of requirements set forth in the quoted Decree. The quality control system for practices licenced as per § 9 of the Atomic Act shall be documented with quality assurance programs whose contents are specified under § 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 licencee prior to issue of a specific licence.

As per § 13, paragraph 5 of the Atomic Act, a licence 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 licenced.

6.3.1.2 Quality Assurance Strategy of ČEZ, a. s.

Quality assurance for the SF and RAW management is provided by ČEZ, a. s. while 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 has implemented and documented a quality assurance system to support the processes and activities in the scope of the above nuclear activities considering the obligations promulgated in the Corporate Quality Policy. This quality control system was designed to support processes and practices in the area of handling of SF and RAW in a controlled and organized manner, fully sheltered by the Atomic Act and its implementing regulations, including SÚJB Decree No. 214/1997 Coll.

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

The quality control system for nuclear activities has been gradually integrated into the corporate management system. It is well used to demonstrate the qualification and responsibility of ČEZ, a. s. toward SÚJB as a holder or an applicant for a specific licence as stated under §9 of the Atomic Act.

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

6.3.1.3 Quality Assurance Strategy of SÚRAO

For management of activities associated with disposal of radioactive waste, the Ministry of Industry and Trade established the organization of SÚRAO whose office and scope of 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 on the 15 May 2002 which proposed 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, that is any quality or safety issues of repositories, being nuclear facilities, are given the highest priority.

The requirements under § 21, SÚJB Decree No. 214/1997 Coll. are thoroughly applied to designing of an underground repository.

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 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 system of ČEZ, a. s. is described in a suite of control documents. These control documents include:

- Strategic documents (e.g. Quality Policy, Safety Policy, etc.) – Level I
- Control documents (ČEZ, a. s. rules, guidelines, and procedures, or guidelines and procedures for nuclear activities) – Level II
- Working documents (NPP Dukovany and NPP Temelín procedures) - Level III

The working output (records) is also part of the quality system documentation of ČEZ, a. s.

In order to assure quality for nuclear activities, ČEZ, a. s. provided PZJ, in particular describing the quality system of the licencee, and the affected processes and activities, including definition of responsibilities for the licencee and its contractors. PZJ are characterized as licence documents using the above-mentioned suite of control documents for description. They follow the requirements under § 32, SÚJB Decree No. 214/1997 Coll. for each licenced activity as stated in the Atomic Act, § 9 (that is, including the licenced activities/practices for handling of SF and radioactive waste).

PZJ are submitted by ČEZ for approval by SÚJB since their approval is required for a licence to be issued for particular activities.

In relation to establishment of a new organizational unit – Nuclear Energy Section of ČEZ, a. s. at 1 January 2003 whose mission is to handle activities associated with generation of electricity and heat from the NPP Temelín and NPP Dukovany, PZJ for the Nuclear Energy Section was submitted and approved by SÚJB. This particular PZJ is designed to shelter the quality system for nuclear activities of ČEZ.

PZJ for licenced 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 system of SÚRAO is described in a suite of control documents and planning documents.

The control documents are organized into 4 layers. The top layer comprises documents which set forth the quality policy and the safety policy, environmental relationship, and the Management System Guide. Layer 2 includes rules and orders which provide the general requirements associated with each chapter of the Management System Guide. Layer 3 and 4 comprise control procedures for each activity and the specific operating procedures and guides.

The planning documents include:

- Plans (long-term, 3-years, yearly),
- Quality Assurance Plans,
- PZJ for each licenced activity – repositories.

PZJ's 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 Assurance System for performance of each activity, and determine the scope of application for activities described within the quality assurance control documents.

6.3.1.5.3 Quality Assurance Programs of ÚJV Řež a. s.

ÚJV Řež a. s. keeps on their own site the SF from research reactors and HLW generated from some other activities. RAW collection, transport, treatment, treatment and storage are handled in a similar way. In order to assure quality of the above activities, the company has implemented a quality system described in the Quality Assurance Manual, control QA procedures, and the set of control documents.

The Integrity and Technical Engineering Division operate the HLW storage facility. The quality assurance 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. The quality assurance program provides a similar function for the RAW management.

For the individual parts of the quality assurance system to be completed, both the documents are focused 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 ČEZ Quality Assurance Program Efficiency Evaluation

The company of ČEZ has established the process quality control and verification responsibilities at each level. The responsibilities for equipment quality and process verification are provided in the control documents as being part of the documented quality assurance system. 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 discrepancies, and demand the appropriate corrective actions if necessary. Persons who do not perform inspection or verification activities shall verify the stipulated quality. Any person employed with the company has the right to initiate improvements or revisions to the quality assurance system.

For maintenance and improvement of the quality assurance system, the regular education and training for quality of the ČEZ employees is perceived as an investment in quality. There is an integrated training process used for the ČEZ employees in the scope of quality assurance and improvement at each level of management. The training program for the management and the rest of employees focused on quality is based on the quality concept adopted by ČEZ. The purpose of the training program is to understand the quality control system, and tools or methods needed for all the employees to get involved in the quality assurance and improvement process, and participate in creation, application and improvement of the quality assurance system.

The quality system is evaluated for efficiency and the system updated periodically as of the end of the calendar year. The supervisors at each level of management perform periodic assessment of all processes and procedures in their scope of responsibility aimed to review the condition and efficiency. The quality assurance system of NPP Dukovany where ISFSF Dukovany is operated is subject to evaluation on a quarterly basis.

6.3.1.6.2 SÚRAO Quality Assurance Program Efficiency Evaluation

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 of the supervisors periodically review the 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 suppliers of items important for nuclear safety and radiation protection. The training system was 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 SÚJB Decree No. 315/2002 Coll.

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

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

- Validate the input documentation;
- Determine the supervisory activity while the project is being designed (operating activities);
- Define any contingencies and risks;
- Propose the control processes and specify reference parameters of the process;
- Define corrective actions and their verification;
- Verify efficiency of the stipulated measures by the Division Supervisory Committee for Nuclear Safety and Radiation Protection;
- Review feedback application by the Nuclear Safety and Radiation Protection Supervisory Committee of ÚJV Řež a. s., or discuss serious events with the company management.

6.3.1.7 Current Practice of State Supervision in Quality Assurance

According to § 39 of the Atomic Act, SÚJB is responsible to perform supervision of the licencee for compliance with provisions of this Act, including the above requirements for quality assurance. If deemed necessary, SÚJB may extend this task to cover also contractors of the licencee. The supervision is focused both on the system and quality assurance of the specific selected equipment. The SÚJB departments responsible for this task are primarily the Department of Nuclear Installations Assessment and the Department of Radiation Protection in Fuel Cycle (see Fig. 5.2).

In compliance with the Atomic Act, SÚJB shall approve quality assurance programs of NI for disposal and storage of SF and disposal and storage of RAW that are essential for issue of the below licences as per § 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,
- Handling of ionizing radiation sources,
- RAW management,
- Handling of nuclear materials,
- Technical 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 NI 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 law fully enforces the internationally respected principles of radiation protection based on the recommendations provided by prestigious international non-governmental expert organizations (ICRP), and in particular the ICRP recommendation No. 60 issued in 1990 or the 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 law 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 the year 2002 by amendment to the Atomic Act and its implementing regulation – Decree No. 307/2002 Coll., on radiation protection.

The Atomic Act defines the 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 utilization of nuclear energy, or tasks leading to exposure are determined under § 4 of the Atomic Act. In particular, the below general obligations are included:

- Regard that utilization of nuclear energy, or radiation practices, or interventions to reduce exposure due to a radiation incident are justified with the benefits that compensate for the risk that will or may arise in performing these tasks (the justification principle),
- Maintain the level of radiation protection when utilizing nuclear energy, or radiation practices, or interventions to reduce exposure due to a radiation incident such that human life and health and the environment are jeopardized 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 licence is required for the activities as listed under § 9 (siting, construction, commissioning stages, etc. – for details see Chapter 5.2). This requirement also applies to discharge of radionuclides into the environment and the RAW management. For the licencees, a number of additional requirements are set forth under § 17 through § 20 of the Atomic Act. The following requirements are focused on the radiation protection of a nuclear installation:

- Establish radiation protection in the scope relative to each licence and provide permanent supervision of compliance with the rules of radiation protection;
- Follow the terms of the licence issued by SÚJB, proceed in compliance with the approved documentation, and investigate immediately any breach of those terms or procedures, and adopt corrective measures to prevent recurrence of such event, including the obligation to immediately report to SÚJB of all occurrences that any of the exposure limits was exceeded;
- Adhere to the technical and organizational conditions for safe operation of NI 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 licence,
- Present information to the public on provisions for nuclear safety and radiation protection that is not confidential to the government, service, or business,
- 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, workplace 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 considering 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 the initial preventive medicals and periodic preventive medicals at least once a year for Category A workers, and in cases that the exposure limits were exceeded as reviewed by the Office, provide an extra preventive medical and a consequent medical if recommended by the Office, and furthermore verify the mental capability of those employees who perform tasks that immediately affect nuclear safety
- Set up a training and testing system for qualifications and special technical skills of employees based on the relevance of their jobs.

In case of a radiation incident, the licencee 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, 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, give immediate alert to the population in the emergency planning zone,
- Remove immediately the consequences of a radiation accident from the areas operated by the licencee, and perform actions to protect the personnel and other persons against the ionizing radiation effects,
- Monitor the exposure of 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 licencee,
- Cooperate to remove the consequence of a radiation accident in the facility of the licencee,
- 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 are stipulated in the Atomic Act, Chapter four.

Depending on the level of radioactive contamination, we recognize three categories of RAW. The first is waste contaminated with such a low rate of radionuclides that it may be released into the environment without a SÚJB licence. Second is RAW with higher rate of contamination, however, releasable into the environment subject to a relevant administrative procedure, based on a SÚJB licence, in a manner and conditions specified in that licence. The third category is waste so highly contaminated with radionuclides that it must be in long-term isolated from the environment – RAW repository. RAW disposal is delegated by law to the state organization of SÚRAO.

The essential Decree used to implement the Atomic Act in the area of radiation protection is Decree No. 307/2002 Coll., on the radiation protection. This Decree specifies the 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, that is the radionuclides naturally contained in human body, and to space radiation which is common on the earth surface, or the radiation caused by radionuclides present due to human interventions into the earth crust, or any other radiation from natural sources of ionizing radiation not modified by human interventions.

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

- *Details concerning the method and scope of radiation protection during work at any workplaces where radiation activities are performed, including the definition, identification, and announcement or approval details for the monitored or controlled areas within such workplaces,*
- *Details for the performance of activities related to the execution of work being associated with higher presence of natural radionuclides or higher impact of the cosmic radiation causing or possible to cause a significant increase in exposure of the individuals (hereinafter „Working activities with increased exposure from natural sources“), and determination of the affected workplaces or individuals, and the scope of measurement and guidance values for interventions to lower the increased exposure from natural sources,*
- *Details concerning the preparation and execution rules for the interventions to eliminate or reduce exposure, and specification of the guidance values for such interventions,*
- *Release and clearance levels, exposure limits, optimizing limits, limits for the content of natural radionuclides within construction materials or waters, and the upper allowed levels of radioactive contamination of the foodstuffs,*
- *Details concerning the classification of ionizing radiation sources and categorization of the radiation personnel or workplaces where radiation activities are performed,*
- *Technical and organizational requirements, procedures and guidance values to demonstrate optimizing of the radiation protection,*
- *The scope and method for the ionizing radiation source management, and the radioactive waste management, and discharge of radionuclides into the environment being subject to a specific licence, and specification of details concerning the radiation protection assurance during these radiation activities,*
- *Medical exposure conditions, diagnostic reference levels, and the rules for exposure of such individuals who voluntarily assist to the persons undergoing medical exposure,*
- *Technical and organizational conditions for safe operation of the ionizing radiation sources and places working with these sources,*
- *Definition of the values, parameters, or other facts important for radiation protection, and the scope of monitoring for those, and measurement, evaluation, verification, recording, archiving, and submittal of the data to the State Office for Nuclear Safety* “.

The Decree No. 307/2002 Coll. stipulates, for example, the classification criteria for ionizing radiation sources as insignificant, minor, simple, significant and very significant sources (§ 4 through § 10), classification criteria for workplaces where radiation activities are performed (§ 11 through § 15), or the classification criteria for the radiation personnel (§ 16). The

Decree also details the procedures and criteria applicable to the radiation protection optimizing (§ 17), including specification of the exposure limits (§ 18 through § 22).

6.4.2 Implementation of Radiation Protection Requirements

6.4.2.1 Dose Limits

The most common limits used to regulate whole body exposure are presented by the internationally 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 limits set for Category A or B radiation workers, that is persons above 18 years, whose exposure to the ionizing radiation sources at their jobs is deliberate and voluntary, following a justified advice of the possible exposure level at work as well as the associated risk, shall be 100 mSv within five consecutive calendar years while the value of 50 mSv shall not be exceed per calendar year. For employees of 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 kept at least for 50 years. For monitoring of Category A or B workers, Decree No. 307/2002 Coll. also established so called derived limits which are a lot easier to track and control and using more directly measurable parameters.

The effective dose limits for persons from 16 to 18 years (students and apprentices) who get into contact with the ionizing radiation sources deliberately and voluntarily, following a justified advice of the possible exposure level at work as well as the associated risk within specialized training for their work with the ionizing radiation sources, shall be 6 mSv per calendar year.

The general effective dose limits, that is the limits applicable to any other population, shall be 1 mSv per calendar year, or as specified under the licence 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 activities being considered. If there is no direct data available for calculation, the 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 neighboring population.

6.4.2.2 Conditions for Radioactive Releases

The radioactive releases from nuclear installations, both liquid and gas, are subject to licence issued by SÚJB as per the provisions of the Atomic Act (§ 9, paragraph 1, letter h), and the detail information, including the criteria for issue of such a licence, is given under § 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 of releases from NI are not specified in any regulatory document. They are determined individually by SÚJB for each particular NI and they are set less than 50 μSv/y for both the Czech nuclear plants. The achieved values of releases are controlled and evaluated by the utility based on the release monitoring program approved by SÚJB.

There is an extensive monitoring system built to monitor the actual releases and used by the utilities 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, limits and procedures to demonstrate the level of radiation protection as reasonably achievable are specified under § 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 of the relevant critical groups of population,
- In 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 considered the need for valorization of these amounts.

6.4.2.4 Radiation Monitoring in the Vicinity of Nuclear Installations

The operator (Licencee) 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 NI is performed directly by the operator through its specialized departments (the 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 the teledosimetric system operated by NPP. 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 Regional Center of SÚJB in Brno. The Environment Radiation Monitoring Lab and the Regional Center of SÚJB in České Budějovice monitor the vicinity of NPP Temelín.

Since the NI 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 is additional measurement performed in the vicinity of NPP, in particular aimed to detect and assess any possible radioactive leaks, and provide a credible basis to determine on the protection measures for the population. Those are measurements within the National Radiation Monitoring Network whose function and structure are stipulated under the Decree No. 319/2002 Coll. SÚJB is responsible to control the activity of the National Radiation Monitoring Network, both the permanent components, and the emergency components. The permanent components are used for monitoring of the normal operation while the emergency components would be activated if there is an emergency. The normal mode is primarily used for monitoring of the actual radiation situation and early detection of a radiation accident while the emergency mode is used to evaluate the consequences of an accident. The results of monitoring are submitted as annual reports of 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 Center 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 the international exercises that the Czech Radiation Monitoring Network as a whole is comparable to the rest of Europe concerning the equipment as well as the density of measurement points.

6.4.3 Supervision

As stated in the Atomic Act, SÚJB is responsible for state supervision of radiation protection in the Czech Republic. SÚJB is authorized under the Atomic Act to adopt decrees in order to implement this law, and deliver the appropriate licences for management of the ionizing radiation sources and other radiation activities as determined by law – see Chapter 5.2.2.

The inspectors of radiation protection of SÚJB supervise the radiation protection. At present, there are total of 52 inspectors both at the headquarters in Prague and seven detached workplaces all over the country referred to as the regional centers. An inspector may only be a person with technical skills in the supervised area and the relevant university degree plus three years of technical experience. An inspector will be 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 treatment of uranium, radioactive waste, 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 control 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 licencees, that is operators of NI 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.

The Atomic Act, § 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)."*

This section also explains the concept of emergency exposure of individuals 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:

- NI including RAW repository, except of the repositories solely containing 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 licence 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 licencee,*
- *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,*
- *Using the National Radiation Monitoring Network and based on evaluation of the radiation situation, provide the basis for decision about the measures intended to reduce or eliminate exposure due to a radiation accident."*

The Atomic Act, § 4 set forth the 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, § 17 imposed on the licencee, as part of the general obligations, to ensure the emergency preparedness, including verification in the scope of each licence, and report to SÚJB immediately on any variance relevant for emergency preparedness, including any changes to the facts critical for issue of the licence.

The provisions under § 18 of the Atomic Act set forth, among other obligations of the licencee, 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 following is set forth under the Atomic Act, § 19, paragraph 1, as part of the obligations of the licencee in case of a radiation incident 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 District Authority, 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, § 19, paragraph 3 set forth the obligation of the licencee to submit the necessary data to the appropriate regional authority and the affected municipal offices in order to prepare the off-site emergency plan, and provide cooperation to establish emergency preparedness in the emergency planning zone in the scope as per the government order, and share the cost of provisions for the emergency preparedness.

The 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 concept of emergency preparedness the extraordinary event, and provides the details to establish emergency preparedness at NI or workplaces where radiation activities are performed:

- Identify an extraordinary event,
- Assess the severity of extraordinary event,
- Report the extraordinary event,
- Control and perform an intervention,
- Methods used to limit exposure of the employees and other persons,
- Training of the employees and other persons,
- Test and verify emergency preparedness.

This Decree also specifies the following:

- Requirements for intervention procedures and instructions,
- Medical support principles,
- Documentation requirements for actions during an extraordinary event.
- 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.

In parallel, this Decree determines the scope of documentation to be provided by the licencee for emergency preparedness, that is on-site emergency plans or 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 following is set forth under Decree No. 307/2002 Coll., § 98 through § 103, 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, defines the basic and other units of 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 regions and municipalities 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 the crisis management (Crisis Act). This Act also stipulates the obligations of regions, municipalities, and legal entities or natural persons in relation to management of emergency on the territory affected by an extraordinary event.

The Act No. 240/2000 Coll., on crisis management (Crisis Act) 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 possible to be misused to 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 (regions or municipalities), and the crisis 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. 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 NI or a workplace with a very important source of ionizing radiation.

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

6.5.2 Implementation of Emergency Preparedness Measures, inc. 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 the operation of a NI or a workplace where radiation activities are performed, the events are classified in three basic levels (SÚJB Decree No. 318/2002 Coll., § 5):

- *„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 is a radiation incident which can be resolved by activation of the intervening persons of the licencee, that is using the forces and means of the licencee, or the forces and means contracted by the licencee.*
- *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 is a radiation accident that requires not only activation of the intervening persons of the licencee 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 recent law, in particular for the area of crisis management, the emergency preparedness system was established in the Czech Republic for various emergency occurrences / extraordinary events. Figure 6.1 outlines the basic structure of the crisis / emergency preparedness system.

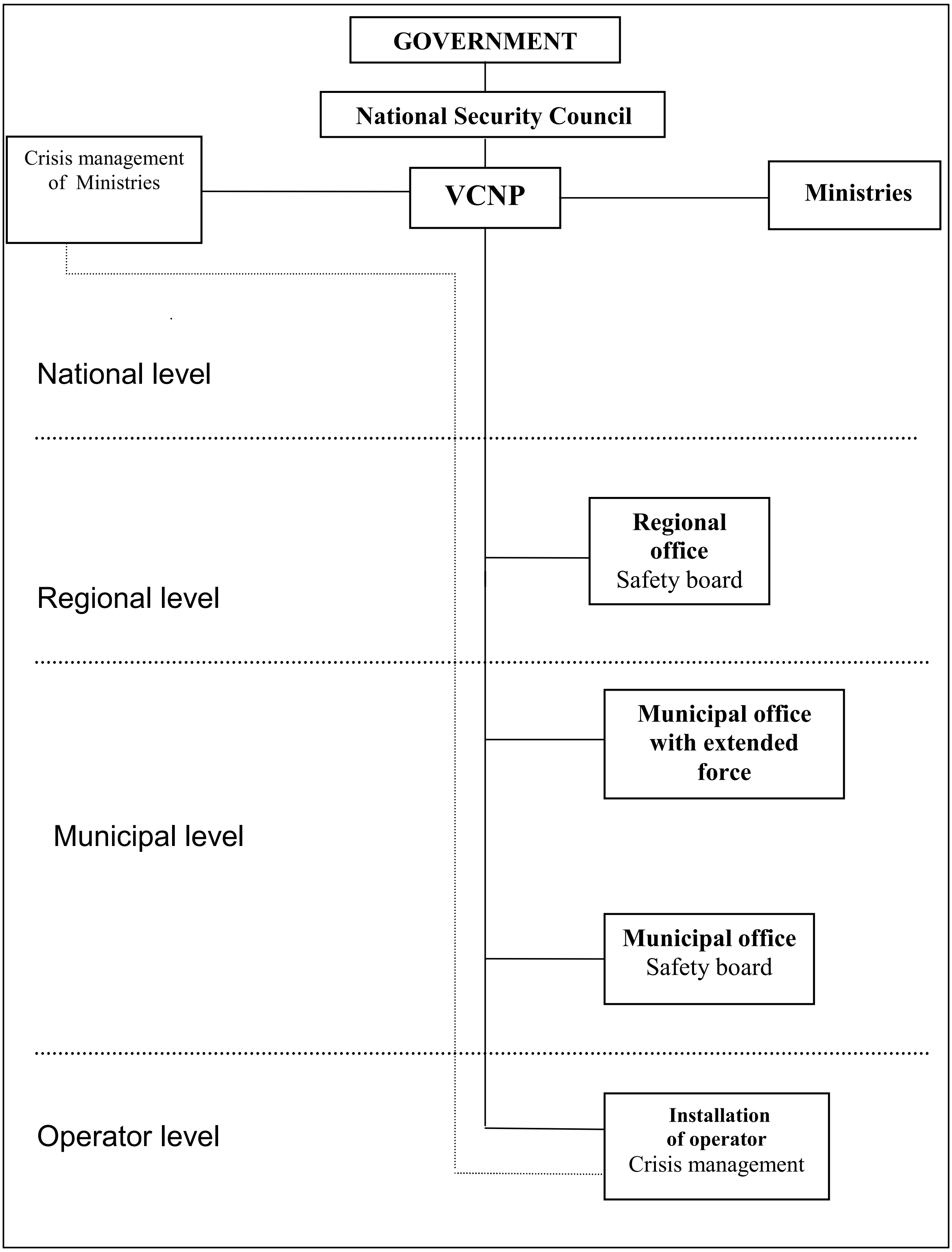

Fig. 6.1 Basic structure of emergency preparedness in the Czech Republic

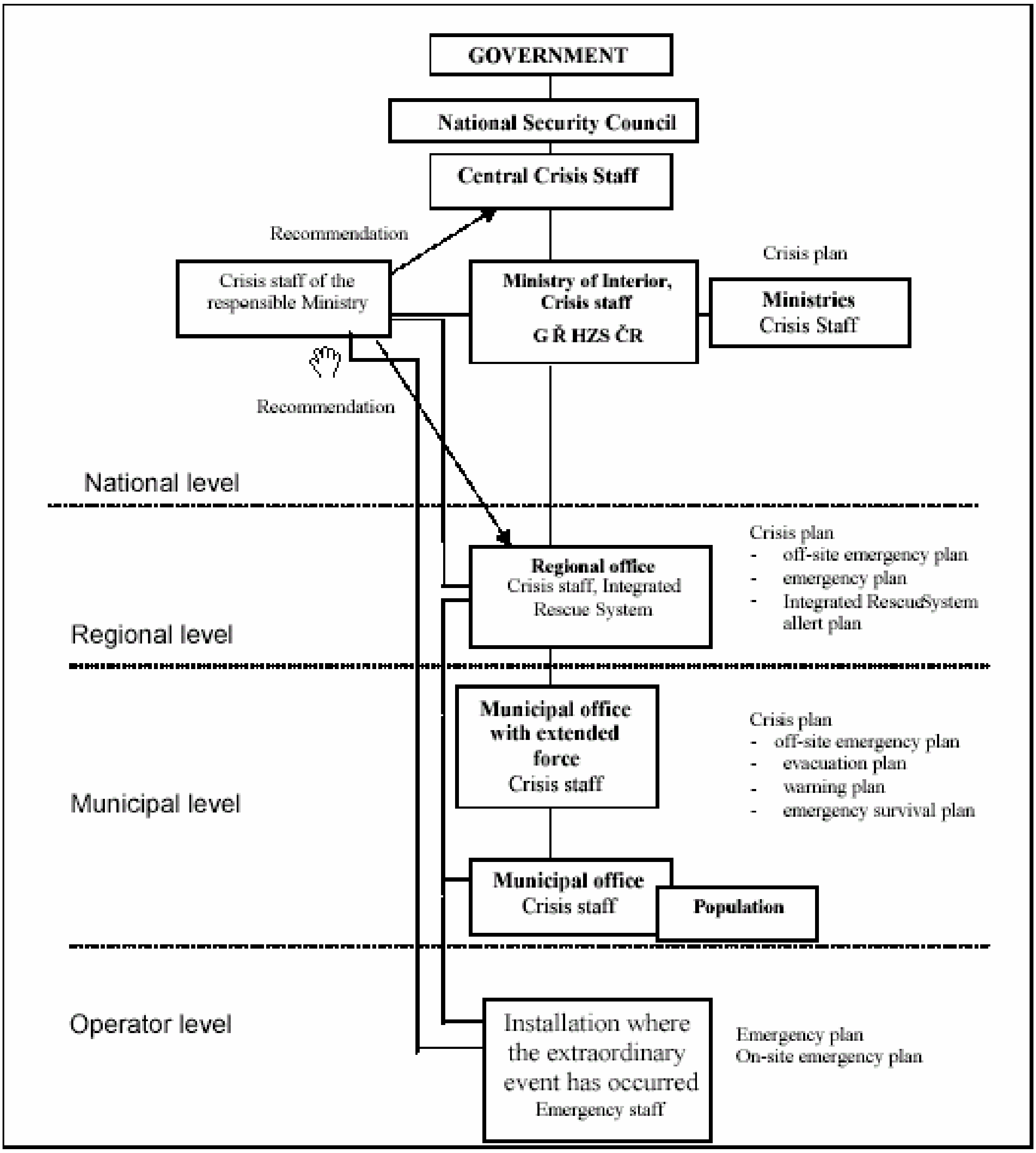

Fig. 6.2 Emergency response structure of the Czech Republic

An extraordinary event, e.g. an accident in the Czech Republic or abroad with possible impact on the territory of the Czech Republic, shall be resolved 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 safety of the Czech Republic. The BRS was set up as the working body of the Government to address tasks or issues within the safety area stipulated under Article 9 of the Constitutional Act No. 110/1998 Coll.

The essential role of the Council is to participate in creation of a reliable national safety system, and perform co-ordination and supervision of the measures created to ensure the safety of the Czech Republic and the international relations. The Prime Minister of the Czech Republic is the Chairman of the Council.

There are four standing working committees of the Council:

- Foreign Safety Policy Coordination Committee,
- Defensive Planning Committee,
- Civil and Emergency Planning Committee, and
- Intelligence Committee.

The Council may as the need be, and typically proposed by members of the Council, set up or revoke technical working teams, in general headed by a member of the Council. The technical teams are responsible to address partial issues in the scope of the Council, and in particular dispose the data as required for a meeting of the Council.

VCNP is the standing working body of the Council responsible for coordination and planning of the measures adopted to protect the interior safety of the country, population, economics, including provisions for a radiation accident and coordination of requirements for civil resources necessary to ensure the safety of the Czech Republic.

This committee was instituted under the Government Decision No. 391 dated from 10 June 1998. The Minister of the Interior is the chairman of the Committee, and the SÚJB chairman is a member of this Committee.

The Committee may set up and appoint the head of a subcommittee or a technical working team consisting of its members, and representatives of the relevant Departments or other administration bodies, or some invited experts to discuss the relevant issues.

The Central Crisis Staff were instituted as the working body of the BRS to handle extraordinary events or other serious situations concerning the safety interests of the Czech Republic. The Crisis Staff were instituted under the Government Decision No. 33 dated from 11 January 1999. As of 1 January 2001 that the Act No. 240/2000 Coll. came into force, the Crisis Staff was established as per the provisions under § 4 of this Act. By the Government Decision No. 53 of 10 January 2001 which amended Decision No. 33 of 1999, the Staff are included in the system of Council bodies. The chairman of SÚJB is also a member of the Crisis Staff.

Based on the proposal of BRS, the Prime Minister shall appoint the Chairman of the Crisis Staff:

- Minister of Defense – In the event of external military threat for the Czech Republic, or performance of alliance obligations abroad, or participation of the Czech military forces in the international operations to restore and maintain peace,
- Minister of Interior – For any other jeopardy of the Czech Republic, or a larger scope of the humanitarian aid provided abroad, or involvement of the Czech Republic in the international rescue operations in the case of accidents or natural disasters.

If an emergency is declared (country in jeopardy, war establishment) as well as if there is a threat of emergency or another serious event, the Crisis Staff shall work to resolve those situations. Their proposals for solution shall be submitted at the BRS meeting and if there is a danger of delay, at the very meeting of the Government.

The Staff shall provide flexible coordination, monitoring, and evaluation of the measures as being implemented based on decision of the Government, Departments, or any other administration bodies to prevent or resolve the occurrence of emergency, or another serious event as well as provide support to the crisis management bodies of the regional offices or local governments.

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

The NI 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.

Specifically the following licencees shall submit the above scope of emergency preparedness documentation:

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

The holders of operating licence for NI 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 the SF management for ISFSF Dukovany. The on-site emergency plan of ÚJV Řež a. s. encompasses the 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 the on-site emergency plan documentation; as well any change or amendment to this documentation is subject to approval. SÚJB is responsible to monitor the provision for emergency preparedness of each licencee, in particular following an 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 NI 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 set up emergency planning zones based on the assessment of considered extraordinary events and their consequences in terms of technologies of a NI 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 defined 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 participation with the district offices[3] whose jurisdiction would cover the emergency planning zones.

6.5.2.5 SÚJB Response to Extraordinary Event

In compliance with provisions of the Atomic Act for occurrence of a radiation incident/accident, SÚJB shall support the activity of KKC and control the activity of the National Radiation Monitoring Network with the role of headquarters. In compliance with provisions of the Crisis Act, KKC is the crisis management center, i.e. they also provide 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 / accident.

For any occurrence of extraordinary event, the Crisis Staff's activity at the KKC station shall be focused to:

- Evaluate and forecast the development of technology conditions in conjunction with the measures being implemented by the operators of the nuclear installation, including detection of the source element for radioactive leaks into the environment, that is based on the data and information provided from the NI and using the technical equipment, and methodology or program tools,
- Evaluate the performance of on-site emergency plans,
- Evaluate the radiation situation of the NI based on the data and information provided and using the technical equipment, and methodology or program tools,
- Work with CHMÚ to forecast the propagation of radioactive materials from the source of radiation accident, and provide information on the potential exposure in the vicinity of the NI 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 element of radioactive leaks and the affected area based on the data and information achieved by monitoring of the radiation situation using the teledosimetric systems of the nuclear installation, mobile teams in the vicinity of the nuclear installation, aircraft crews, 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

[3] District offices were cancelled as of 31December 2002, and the off-site emergency plans shall be henceforth prepared by the regional offices with the involvement of the affected municipalities.

affected crisis staff, safety board, and if applicable, the Government, or other state administration bodies, and the public,
- Report to IAEA as stated under the treaty on timely announcing of nuclear accidents and treaty on assistance in case of a nuclear or radiation accident,, and the contact points of other countries based on the international bilateral agreements in force.

6.5.2.6 Training and Practice

The NI 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. There are specific plans in place for the individuals and components who are determined to control or perform interventions to the on-site emergency plan providing theoretical and practical training focused on the activities performed when an extraordinary event of a specific level is announced, following the intervention procedures / instructions provided in the on-site emergency plan and their associated intervention procedures / instructions. The training shall follow a specific training plan aimed to train and practice activities required to control and perform interventions, starting from identification of an extraordinary event and using the stipulated intervention procedures and instructions.

6.5.2.7 Supervision by SÚJB

SÚJB is responsible to perform supervision of the licencees 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. 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 control 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 NI 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 responsible to even control the emergency training where the scenarios of occurrence and development of a simulated extraordinary event or controls and performance of interventions to the on-site emergency plan, or the associated intervention instructions are monitored.

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 Decommissioning

Decommissioning of a NI in the Czech Republic is regulated by the Atomic Act and its implementing regulation of SÚJB No. 196/1999 Coll., on the decommissioning of nuclear installations or workplaces with important or very important sources of ionizing radiation, as well as the SÚJB Decree No. 307/2002 Coll., on radiation protection.

As per § 2 of the Atomic Act, 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 release the NI or workplaces where radiation activities were performed for other purposes. Decommissioning of a NI shall follow all provisions of Chapter two and three of the Atomic Act in which the general conditions for performance of activities associated with utilization of nuclear power, radiation practices, or exposure limitation interventions as well as the conditions for utilization of nuclear power and ionizing radiation are described.

The Atomic Act, Chapter three set down 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 licence 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 licence applications. The licence shall be issued for each stage of decommissioning of a NI as stated under § 9, paragraph 1, letter g) in the scope and manner set forth in the implementing regulation which is SÚJB Decree No. 196/1999 Coll.

The preparation for decommissioning shall be included in each stage of lifecycle of a nuclear installation. The Annex to the Atomic Act provides the contents of documentation required for issue of the licence for each activity under § 13 of this Act. The siting licence documentation for a NI shall include as stage 1 of decommissioning 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 licenced, 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 cost of decommissioning verified by SÚRAO. The operating licence documentation for a NI shall include the proposed method of decommissioning approved by SÚJB as well as the estimated cost 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. 196/1999 Coll.

The decommissioning licence application shall include the data and supplements as required by the Atomic Act and defined under Section 13. The evaluation of environmental effects of decommissioning shall be a prerequisite for issue of the decommissioning licence 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 is obliged as per § 13 to submit the required documentation as part of the decommissioning licence application. The binding contents of the licence documentation for each stage of decommissioning of a NI are provided in Item G. of the Annex to this Act. The decommissioning licence documentation to be approved by SÚJB shall comprise the limits and conditions of RAW management 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 § 13 of the Atomic Act 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 licence. The licencee shall submit to SÚJB for approval the decommissioning programs specified under the licence.

Provisions under the § 18 of the Atomic Act, on the responsibilities from the view-point of the nuclear safety, radiation protection, physical protection and emergency preparedness, impose on the comissioning and/or operation licence holders to monitor, measure, evaluate, test and keep records on the quantities, parameters and facts, in the scope of implementing regulations, important from the view-point of the decommissioning, during entire lifecycle of a NI, and to archive these documents to be available for the needs of decommissioning. The holder of operating licence shall keep and archive records of the ionizing radiation sources, buildings, materials, activities, quantities and parameters, or other relevant facts, and he shall even limit the generation of RAW and SF to the necessary extent.

For decommissioning of a nuclear installation, the holder of operating licence is liable under the provisions of Atomic Act, § 18, and based on the estimated total cost of decommissioning as verified by SÚRAO, to create evenly provision for the financial funds deposited on a blocked account to be available for the preparation and execution of decommissioning in required time and at the cost in compliance with the decommissioning proposal approved by SÚJB. A joint implementing regulation of the Ministry of Industry and Trade and SÚJB is Decree No. 360/2002 Coll. which stipulates the method of creating the provision for decommissioning of a NI or Category III or IV workplace. The funds kept on a blocked account can 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 such provision applicable to the state organizations, public universities, or local government. As stated under § 26 of the Atomic Act, the provision created by the holders of operating licence for decommissioning of their installations shall be supervised and drawing funds on this provision shall be approved by SÚRAO established by the Ministry of Industry and Trade as a state organization to perform the activities associated with disposal of RAW.

In compliance with § 28 of the Atomic Act, the state may subsidize disposal of the old radiation burdens in the scope equal to the cost of decommissioning for installations commissioned prior to their privatization, including any necessary research or development work. Pursuant to § 48 of the Act, a state company whose founder declared depression, shall not be obliged to create the provision for decommissioning.

The details and requirements for the method and scope of decommissioning and radiation protection assurance while decommissioning of a NI are specified under the below implementing regulations of the Atomic Act:

- SÚJB Decree No. 196/1999 Coll., on the decommissioning of nuclear installations or workplaces with important or very important sources of ionizing radiation, and
- SÚJB Decree No. 307/2002 Coll., on radiation protection.

The SÚJB Decree No. 196/1999 Coll. provides details for radiation protection during the decommissioning of a NI and details for the method and scope of documentation.

Section 3 of this Decree defines individual method of decommissioning based on the relationship of decommissioning activities and their separation into time periods and material stages, and direct decommissioning or deferred decommissioning. According to the extent of necessary decontamination and demolition work, utilization of sites, and the required supervision of the locality, the process may be classified as direct decommissioning, decommissioning without dismantling or with dismantling, or safe enclosure of a nuclear installation. The method selected for decommissioning depends on the type and level of contamination of the installation.

Section 4 of the Decree provides details of the preparation for decommissioning of a NI being an inherent and steady part of the radiation protection system as early as the siting, construction and operation. It also defines the requirements to be considered during preparation. A proposed method of decommissioning shall enable to review the considered decommissioning activities in terms of nuclear safety, radiation protection, physical protection and emergency preparedness. As stated in Section 4, the proposed method of decommissioning shall be updated at least once in five years to update the estimated cost of decommissioning, or if any of the crucial items used to elaborate the proposal are changed.

Section 5 of this Decree defines the conditions of the decommissioning of a NI considered as change with considerable impact on the radiation protection, thus being subject to approval by SÚJB (as per § 9 of the Atomic Act). The same Section also stipulates that under the normal conditions the operation of a NI with a nuclear reactor shall not be terminated prior to fuel unload from the reactor.

Section 6 of this Decree details the decommissioning process, in particular the deferred decommissioning, including the method of termination and use of protection barriers even for protective enclosure of a NI.

The method and scope of documentation are provided under Section 7 of the Decree, and detailed proposal in terms of the decommissioning technique is given under Section 12. This proposal is based on the method used for workplaces with open radionuclide sources as listed under Section 10 supplemented with additional details such as planned use of the site during and afterthe decommissioning, and description of changes of the environment in the vicinity of the installation due to operation as well as the anticipated impact on the vicinity, and description of availability and verification in practice of the proposed technological procedures, and description of nuclear fuel disposal management and the method of physical protection under decommissioning. Section 10 of the Decree set forth the requirement to describe the proposed preparation of the organization and the personnel needed to carry out decommissioning activities, and justify the proposed method of decommissioning and the used technological procedures.

The methodology used to estimate the decommissioning cost of the proposed technique of decommissioning is described under Section 14.

Section 35 of SÚJB Decree No. 307/2002 Coll. stipulates that any workplace where radiation activities are performed may only be decommissioned after extent removal of all sources of ionizing radiation and decontamination of the workplace to eliminate radionuclides completed in such a manner and scope that the release levels set forth under § 57 of this Decree or the associated licence issued by SÚJB are not exceeded at any point of the workplace.

6.6.2 Supervision

The licence for each commissioning stage of a NI and approval of the required documentation using the appropriate administration procedure as per § 9, paragraph 1, letter g) of the Atomic Act shall be preceded by on-site supervision. Prior to approval of the method proposed for decommissioning of a nuclear installation, the supervision shall cover the approval process for each commissioning stage as per § 9, paragraph 1, letter c) and the operation as per § 9, paragraph 1, letter d).

SÚJB inspectors of radiation protection control the decommissioning of NI. There are 2 inspectors of the headquarters in Prague intend for this task. As needed for supervision and based on the required qualification, other inspectors of the radiation protection, or nuclear safety of the SÚJB headquarters may get involved as well as inspectors of the regional centers of SÚJB.

The supervision shall follow the scope of SÚJB responsibility to perform supervision set forth under the Atomic Act and based on the internal guidelines of SÚJB.

In the process of decommissioning, the supervision shall be shared between inspectors of the SÚJB headquarters, and inspectors of the regional centers, and local inspectors. Also, permanent supervision by local NPP inspectors is foreseen during decommissioning similar to that of the commissioning and operation of these 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, § 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 shall then be reflected to all implementing regulations associated with the Atomic Act in the Czech legal framework to specify the basic requirements contained in the Atomic Act. The decrees are generally binding law, thus their observance 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 removal under the SF management are given under § 47 of Decree No. 195/1999 Coll., on requirements for nuclear installations to assure nuclear safety, radiation protection and emergency preparedness, which stipulates that:

„The installation for the handling 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 cask 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 cask surface in ISFSF Dukovany during periodical casks 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 its originator or by the Office as the RAW and subsequently disposed in DGR, this activity will be also related to the legislation about the disposal of RAW in the underground (currently Decree 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 responsible for activities associated with RAW disposal, that is also activities associated with SF treatment to provide a form apt for storage, or activities associated with the development, construction, commissioning, operation, and shutdown of repository systems. At present, one of the key programs of SÚRAO is to select a suitable location for SF and HLW deep geological repository.

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 perssonnel limits, or limits for apprentices and students), and the derived limits or the authorized limits of exposure.

Any potential impact on the environment, that is even 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 environmental impact assessment. In Annex 1 of this act there are „The installations designed for treatment of spent or irradiated nuclear fuel or highly active radioactive wastes“ assigned to Category I. as 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 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 and equipment review. During the refueling some of the SF assemblies of VVER 440 type 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 of CASTOR-440/84 type.

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

A fuel assembly comprises a bundle of fuel rods, head, foot and a hexagonal envelope. The bundle comprises 126 fuel rods deployed within a triangle lattice of step 12.2 mm. The geometry of rods is secured with ten distance grids, and an upper and lower grid.

The basic parameters of a working FA:

Length	3195 mm
Dimension below the key	145 mm
Total weight	215 kg
Uranium mass	120.5 kg
Initial ^{235}U enrichment	less than 4.38 % weight
Number of fuel rods	126
Fuel rod length	2546 mm
Outer diameter of fuel rod cladding	9.15 mm
Cladding material	Zr+1 %Nb

Outer diameter of fuel pellet	7.54...7.57 mm
Pellet material	UO_2.

A control assembly consists of two separate parts - a fuel part of the assembly and an absorption piece (absorber).

The fuel part structure of a control assembly resembles a working FA. The difference is that the fuel part head of a control assembly is not equipped with resilient reflected pins. There is a special cartridge with a triangle hole to connect the inserted driving rod.

The parameters of the fuel part of a control assembly are identical to those of a working fuel assembly, except of the following:

Length	3200 mm
Total weight	220 kg
Uranium mass	115.2 kg
Initial ^{235}U enrichment	less than 3.82 % weight
Fuel rod length	2536 mm.

7.2.1.1 SF Pools

The FA are stored in SF pool using a compact rack with capacity of 682 FA. 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 FA 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 B/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 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 technical water.

7.2.1.2 ISFSF Dukovany

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

- Provide storage for 60 pcs of CASTOR-440/84 casks containing SF,

- Remove cask using a crane,
- Reduce to minimum the radiation exposure outside of the building to be well below the allowed values,
- Provide cooling for the stored cask and decay heat removal to the environment using natural aeration,
- Create working conditions for the personnel of ISFSF Dukovany,
- Review/inspect and perform minor repairs of cask,
- Protect from weather effects,
- Prevent unauthorized access in conjunction with the physical protection system, and
- Provide shielding from solar radiation.

The ISFSF Dukovany identification:

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 in the dry 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 design of CASTOR-440/84 cask provides following functions:

- Reduce the gamma dose rate from SF on the cask surface,
- Reduce the dose rate equivalent from neutrons on the cask surface,
- Prevent radioactive leakage from the inside space of cask,
- Maintain fuel subcriticality,
- Provide fuel decay heat removal.

These functions of CASTOR-440/84 cask are provided during transport, storage as well as design events.

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

Fig. 7.1 ISFSF Dukovany storage hall with 45 CASTOR-440/84 casks

For the purpose of transport and handling, the cask comprises 2 pairs of trunnions and removable shock absorber plus a protecting shield for storage.

The basic parameters of CASTOR-440/84 cask:

Diameter	2660 mm
Height	4080 mm
Wall width	370 mm
Material	cast iron with spheroidal graphite
Loaded cask weight including the protecting plate (without shock absorbers)	116.110 kg
Maximum FA heat output	21 kW
Maximum total allowed 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	84 pcs
Maximum initial FA enrichment	3.60 % weight ^{235}U
Maximum FA burn-up	42.000 MWd/tU
Minimum FA cooling time	60-69 months depending on burnup
Maximum heat output of a single FA	250 W.

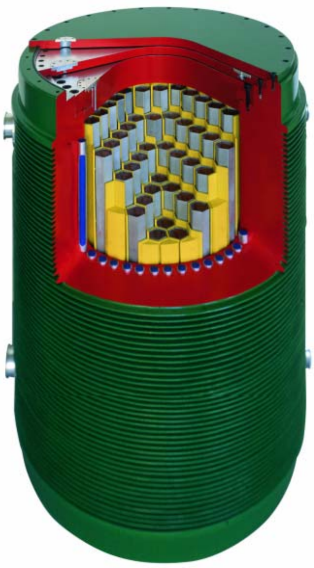

Fig. 7.2 CASTOR-440/84 cask model

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 remines in the reactor for the duration of 4 years.

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

A VVANTAGE 6 fuel assembly comprises 312 fuel rods in a hexagonal arrangement. A measurement pipe reserved for the internal instrumentation holds the central position in a FA. Remaining 18 positions are occupied with the guide/thimble tubes. The guide tubes are connected to the upper and lower nozzles of the fuel assembly providing a support structure for spacer grids.

The basic parameters of a working fuel assembly:

Length	4583 mm
Total weight	766 kg
Uranium mass	563 kg
Initial ^{235}U enrichment	3.8 % weight
Number of fuel rods	312
Rod length	3889 mm
Outer diameter of rod cladding	9.144 mm
Cladding material	zircalloy - 4
Outer diameter of fuel pellet	7.84 mm
Pellet material	UO_2.

The control (absorber) rod bundles of VVANTAGE 6 are divided into two categories: for the control and for the reactor shutdown. The control groups are used to offset any reactivity changes due to variance of the reactor working conditions, that is power or temperature variations. There are two design criteria applied to select a control group – the total efficiency shall comply with the nuclear requirements for the reactor, and since these rods may be partially inserted during power operation, the total coefficient of uneven power distribution should be low enough to demonstrate that the reactor capability to supply the required power is maintained. The control groups and reactor shutdown groups provide a sufficient margin for shutdown. The hybrid absorber materials of VVANTAGE 6 RCCA rods are created using alloy of 80 % silver, 15 % indium and 5 % cadmium (Ag-In-Cd) made into a bar inserted on the end part of the rod, and the remaining part being a stack of full B_4C pellets (70 % ^{10}B enrichment for 71 % calculated density) while all parts are sealed into cold worked tubes of stainless steel type 304.

Two types of burnable absorbers may be used for VVANTAGE 6 fuel. The first one is a fuel integrated burnable absorber using a thin boride layer on the surface of fuel pellets. In this approach, the burnable absorber material is contained inside a fuel rod. The other type is a discrete burnable absorber where the burnable absorber material is contained in separate rods inserted into guide tubes. A single type of burnable absorber or a combination of two types may be used for VVANTAGE 6 fuel. The rods containing a burnable absorber are static, auxiliary reactivity control elements used to compensate for a greater reactivity excess existing in the initial phase of a fuel cycle as consequence to fresh (unirradiated) fuel load. The absorption material of a rod burnable absorber comprises a stack of solid Al_2O_3-B_4C pellets with natural ^{10}B (70 % of density) sealed into a zircalloy - 4 tube (or coating). On as needed basis, the rods containing burnable absorber may be employed in different arrangements inside the bundle. The height of the absorber material stack inside an absorber rod may be changed to facilitate optimizing of the axial shape of power distribution.

7.2.2.1 SF Pools

Fuel unloading 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 fuel assemblies, or fuel rods, the damaged elements are placed into hermetically sealed containers (enclosures). There is one section of the storage rack reserved for enclosures. 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 679 positions are reserved for undamaged fuel assemblies, and 24 positions are reserved for enclosures of damaged FA, 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 fuel assemblies, 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 fuel assemblies 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 that allow accurate horizontal alignment of the plate.

The technical parameters of the rack:

FA nests	679
Enclosure nests	24
Cluster case nests	2
FA spacing	288 mm
Enclosure spacing	400 mm
Absorber tube plate thickness:	4.2 mm
Material	stainless steel.

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 maximum load 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 shaft. It will be used when the level in the above spaces is rising 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 subframe. 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.

7.2.2.2 SF Storage Facility

As provided in the previous sections of this National Report, there is a dry SFSF planned to be constructed at the NPP Temelín site using the storage technology of dual-purpose transport and storage cask. It is envisaged that SF will be stored in SF pool for a certain period where the needed decline in the decay heat power of SF is achieved, and then it will be removed from SF pools to cask under water to be located in ŠTK. The loaded cask will be then dried, evacuated, filled with helium and hermetically sealed at a service point of the reactor hall. The prescribed health physics measurements will be performed. Then cask will be carried down via the transport corridor to be loaded on a special wagon container. The issue of dislocation of the dry storage with cask is being currently addressed as alternative by the ČEZ, a. s. company as the operator of NPP Temelín.

7.2.3 ÚJV Řež a. s.

7.2.3.1 Bldg. 211/7 - SF Storage Facility

By the 31 December 2002, there were 22 pcs of IRT–2M SF assemblies stored in Pool A with the original enrichment of 80 % wt. ^{235}U plus 37 pcs of SF elements with the original 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 was completed during the past few years:

- Purification of the pool water in the SF Storage Facility – water renewal, 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.

Henceforth, the chemical mode of water is controlled and tested periodically, that is:

- Identify the contents of Cu, Al, Fe, Cl ions,
- Identify the volume activity of gamma ^{137}Cs and other fission products,
- A special technique was developed to isolate and identify a low concentration of neptunium, uranium, and plutonium, and their isotope composition in nano or subnanogram amounts,
- Identify uranium or transuranium elements using this technique in the SF Storage Facility,
- Test the method used to identify plutonium in the actual samples, that is reactor water, rinsing water from a leaking fuel element, and water of the SF Storage Facility (different depths of sampling, or slush).

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

In 1995, the accessible places of both Pool A and B were inspected using the 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 cleaned and visually inspected in the year 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 cleaned, it was filled with clean demineralized water and it allows maintaining 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 HLW:

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

The HLW storage process utilizes fixed concrete in barrels of 200 liters within storage boxes (II, IV, VI a VII). The waste from the surveillance program is stored using metal packagings in Box I. Non-standard solid HLW are stored in two boxes (III and VIII).

Box	I.	–	Surveillance program waste
Box	II.	–	Consolidated HLW barrels
Box	III.	–	Non-standard wastes

Box	IV.	–	Solidified HLW barrels
Box	V.	–	Special storage units with FA EK–10
Box	VI.	–	Solidified HLW barrels
Box	VII.	–	Solidified HLW barrels
Box	VIII.	–	Non-standard wastes.

The basic parameters of FA of IRT–M/IRT–2M type:

Initial enrichment	80 % wt. ^{235}U	36 % wt. ^{235}U
Total length	882 mm	882 mm
Cross-section	67 x 67 mm	67 x 67mm
Total weight		
4-tubes	3.27 kg	3.27 kg
3-tubes	2.64 kg	2.64 kg
Uranium mass		
4-tubes	0.214 kg	0.638 kg
3-tubes	0.184 kg	0.550 kg
Fuel tube wall thickness	2 mm	2 mm
Fuel tube cladding thickness	2 x 0.8 mm	2 x 0.4 mm
Cladding material	Al	Al
Pipe core material	U-Al	UO_2-Al
Pipe core thickness	0.4 mm	0.64 mm
Average tube core length	580 mm	600 mm
Maximum burn-up	380 MWd/kgU	178 MWd/kgU.

The basic parameters of FA of EK–10 type :

Initial enrichment	10 % wt. ^{235}U
Total length	550 mm
Cross-section	71.5 x 71.5 mm
Total weight	4.5 kg
Uranium mass	1.28 kg
Fuel rods in FA	16 pcs
Fuel rod outer diameter	10 mm
Fuel rod cladding thickness	2 mm
Fuel rod cladding material	Al
Fuel rod core material	$(U\text{-}Mg)O_2$
Fuel rod core diameter	6 mm
FA average active length	500 mm
Maximum burn-up	24.3 MWd/kgU.

FA IRT–M are covered with a layer of shielding water in the pool (total of 228 pcs). FA EK – 10 are stored dry using special storage units with the final number of 190 pcs. A part of FA (16 pcs) having been kept in the wet storage of the reactor are to be stored in the HLW Storage Facility using the same method as for IRT–M fuel, i.e. Pool B.

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 its operating lifetime as well as that of a disposal facility after closure;

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

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

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

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

At present, there is preparatory work in process on the territory of the Czech Republic to construct just a single facility for SF management, and that is SFSF Dukovany with capacity of 1340 t HM on the site of NPP Dukovany. SFSF Dukovany shall be operated until 2006 due to limited capacity of the existing ISFSF Dukovany. The storage capacity of SFSF Dukovany will be sufficient to cover the generation of all SF from NPP Dukovany once the existing storage capacity of the operated ISFSF Dukovany is saturated until all four units of NPP Dukovany are decommissioned.

The preparation for construction of SFSF Dukovany follows the Government Decree No. 121/1997 dated from 5 March 1997 in which the Czech Government recommended to build SF storage facilities on the nuclear plant sites.

The proven method of storage using dual-purpose casks was chosen for the new storage facility. The following aspects were taken into account when considering the type and location for the new SFSF Dukovany:

- NPP Dukovany has gained enough experience in the process of dry storage of SF using cask in the existing ISFSF Dukovany,
- In terms of radionuclide releases into the atmosphere, the new SFSF Dukovany is not another source that might increase the existing NPP effect on the vicinity,
- In terms of radionuclide releases into the waters, SFSF Dukovany is not another source that might increase the existing NPP effect on the vicinity because all rinsing water used for decontamination will be returned to the relevant NPP systems containing only radionuclides originated from operation of the NPP,
- Locating SFSF Dukovany at the NPP site will not create the need for transport of SF into longer distances, thus considerably reducing the risk associated with transport of SF,
- Locating SFSF Dukovany atss the NPP site gives a prerequisite for ready use of both the technical and human resources of NPP to handle extraordinary events.

In conjunction with the planned construction of SFSF Dukovany, the below key steps were already completed:

- Preparation of the Initial Safety Report,
- Issue of a SÚJB licence for siting of the facility,
- Preparation of the EIA documentation,
- Review of the EIA documentation of SFSF Dukovany,
- Public discussion of the environmental effects of the SFSF Dukovany,
- Issue of an approval by the Ministry of Environment of the Czech Republic,

- Issue of a siting approval,
- Selection of a designer of SFSF Dukovany,
- Selection of a cask supplier for the initial operation of SFSF Dukovany,
- Preparation of a Preliminary Safety Report,
- Issue of a SÚJB licence for construction of SFSF Dukovany at the NPP Dukovany site.

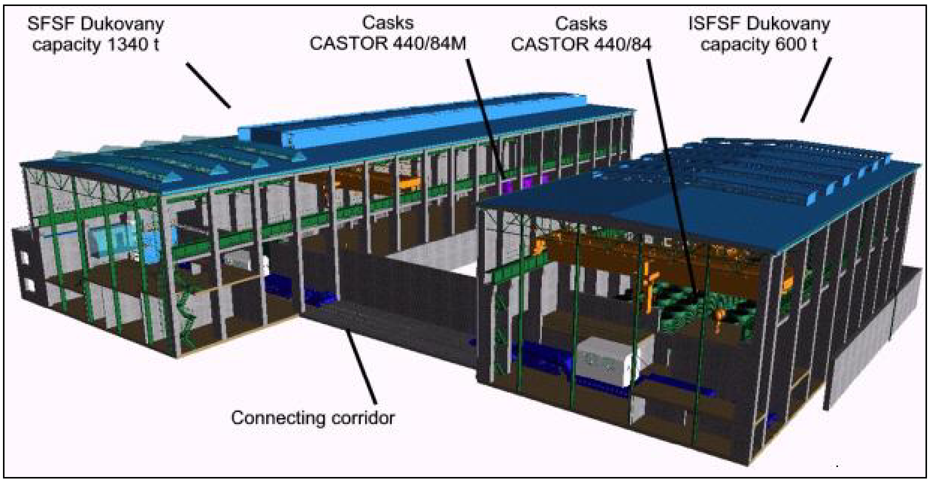

Fig. 7.3 Connection of the planned SFSF Dukovany to the existing ISFSF Dukovany

In respect to selection and approval of a siting location for the planned SFSF Dukovany, the major role was played by the Initial Safety Report and results of the entire process of review concerning the environmental effects of the construction in accordance with the currently applicable wording of the Act No. 244/1992 Coll. (SFSF Dukovany EIA Documentation, independent documentation review, comments by the affected bodies, or public discussion results, etc.) The public discussion of environmental effects by SFSF Dukovany was even witnessed by the Austrian Government Commissioner and by some representatives of the Austrian environmental organizations.

The Initial Safety Report prepared in compliance with SÚJB Decree No. 215/1997 Coll., on the siting criteria for NI and very important sources of ionizing radiation, addressed the below issues:

- Site characteristics and proof of fitness:
  - Storage location,
  - Territory characteristics,
  - Population,
  - Weather conditions,
  - Geology and hydrogeology,
  - Area and location seismicity.
- Technology characteristics and preliminary evaluation:
  - Dry storage and cask technology,
  - Design concept,
  - Preliminary evaluation of nuclear safety,
  - Preliminary evaluation of radiation protection,
  - Preparedness for handling of extraordinary events.
- Preliminary evaluation of the operational effects by the storage facility:
  - Effect on the employees,

  - Effect on the population,
  - Environmental effects.
- Draft concept for safe decommissioning:
  - Storage lifetime and consequent fuel management.
- Quality Assurance:
  - Quality assurance assessment for selection of the location,
  - Quality assurance method for designing and implementation,
  - Quality assurance principles for commissioning and operation.

The EIA documentation of the planned SFSF Dukovany was prepared according to the Act No. 244/1992 Coll., on assessment of impacts of development concepts and programs on the environment, with the following structure:

- Basic construction design and technology data, and the entities involved in designing or preparation,
- Information on the direct environmental effects:
  - Area seizure demand,
  - Media consumption demand (water and other inputs),
  - Transportation demand,
  - Environmental emissions,
  - Waste water release and waste generation,
  - Noise emissions,
  - Radiation emissions,
- Comprehensive description and assessment of the environmental effects:
  - Description of the proposed solution and a reference alternative,
  - Description of the actual environmental conditions in the area of interest,
  - Review of the environmental effects on the area of interest,
  - Description of the measures proposed to limit the environmental effects,
  - Description of the operating risk,
  - Environmental monitoring technique in the area of interest.
- Conclusion.

Based on the positive final recommendation from the review of the construction effects documentation that even considered and responded to the Austrian comments, the Ministry of Environment of the Czech Republic issued an approval for construction of SFSF Dukovany at the site of NPP Dukovany.

The detailed information on the Preliminary Safety Report for SFSF Dukovany, and the consequent issue of a SÚJB licence for construction of SFSF Dukovany is provided in the following chapter.

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.

In conjunction with the previous part of the National Report, note that only the construction of SFSF Dukovany on the site of NPP Dukovany is being prepared in the Czech Republic now. The storage building will be located adjacent to existing ISFSF Dukovany. The total storage capacity will be 1340 t of SF kept in 133 pcs of cask.

The basic SFSF Dukovany data:

Construction title	Spent Fuel Storage Facility
Construction site	Dukovany
Region	Vysočina (Czech Highlands)
Investor	ČEZ, a. s.
Cask supplier for initial SFSF operation	GNB Essen
Construction supplier	HOCHTIEF VSB, a. s.
Designer	Energoprojekt Praha, a. s.
Estimated start date	03/2003
Estimated end date	03/2006.

In the selection process, the joint-stock company of Energoprojekt Praha, a. s. was selected to design the planned SFSF Dukovany. The Preliminary Safety Report for the Spent Fuel Storage Facility is one of the essential documents for the design period which has already been prepared by this company. This report was prepared in compliance with the requirements of the Atomic Act and Annex B thereunder as the documentation for the construction licensing process of a nuclear installation.

The Preliminary Safety Report structure is as follows:

- General description of SFSF
- Natural conditions, population, industry and its distribution in the storage location area,
- Major design criteria,
- Design description,
- Operational safety justification,
- Safety analyses,
- Nuclear material record and control system,
- Physical protection,
- Radiation monitoring system,
- RAW management,
- Commissioning,
- Operation,
- Safe decommissioning concept,
- Quality assurance system.

On the 31 October 2002, SÚJB issued a licence for SFSF construction whereas this SÚJB decision considered two separately approved documents – Proposal of Physical Protection Assurance for the Nuclear Installation of SF Storage on the NPP Dukovany Site and the List of Selected Equipment.

The safety assurance for SF storage in the planned SFSF Dukovany is based on the properties of dual-purpose cask the structure of which meets all of the safety criteria. SFSF Dukovany will only be used for the cask 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 GNB 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 casks as well as the building of SFSF Dukovany.

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 time demand is based on the design documentation of the SFSF process part. The analysis result 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 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.

In reference to the experience gained from operation of the existing ISFSF Dukovany and the analysis of planned activities for SFSF Dukovany in order to reduce the personnel exposure, there are some recommendations to be given in order to optimize the activities associated with the scheduled cleaning of cask in SFSF, and periodical calibration of the casks pressure sensors as well as optimize the cask storage layout of the facility to keep the dose rate in the storage area as low as possible.

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 Dukovany 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 licence for utilization of a NI are met.

The design of radiation monitoring shall cover the following:

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

The radiation monitoring system will be similar to the existing ISFSF Dukovany. That means that the essential parameter to be monitored is the He pressure between primary and secondary lid of the cask, and also temperature measurement on the surface of cask body about half its height as well as the radiation situation in the storage hall. Dislike 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 leaktightness in the course of cask drying, and in parallel control 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 tapping points during construction and even under SFSF operation.

7.4.4 Emergency Preparedness

Any extraordinary event / accident conditions in the planned SFSF Dukovany shall be resolved 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. 196/1999 Coll., on decommissionings of NI or workplaces with important or very important sources of ionizing radiation.

The SF shall be kept safe in SFSF Dukovany until declared for 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 is the cask used for SF storage. It is a highly safe storage technique with minimum generation of operating wastes of which the majority reaches only radioactivity values allowed for the release into the environment.

The decommissioning of SFSF Dukovany shall be preceded by removal of all casks with SF 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 construction 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. Nor dismantling or demolition work is envisaged since the storage building is planned to be used for storage and handling as 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 decision 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 NPP Dukovany Unit 1 and is based on the original Pre-operational Safety Report for NPP Dukovany 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 (licence 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 NPP Dukovany, and reviewed by SÚJB to issue licences 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 licence to operate EDU reactor units after 2005.

For the SF pools the document analyzes, among others, also the following extraordinary situations:

Fall of a fuel assembly during SF handling

Since the placement of FA in a SF pool is approximately equally solid as in the reactor core the situation has been evaluated as an analogy to the fall of a FA in the reactor core. The only difference has been in the height of the fall; the impact speed in this case is 9.086 m/s, i.e. lower than in case of a similar event in the reactor core (12.106 m/s). The fuel assembly deformation will be therefore smaller and the cladding will not be damaged.

Loss of water in the pool

Immediate total or significant loss of coolant in the SF pool is nor realistic and hypothetically it might be caused by reactor destruction or by airplane crash. The pool is protected against slow leakage with a double metallic hermetic lining and by monitoring of coolant leakage, level and temperature. A potentially fast partial loss of coolant from the SF pool may occur in case the SF is stored in two layers (during reactor inspections and core unloading) at the prescribed level +21.00 m and if there is no coolant in the adjacent space of reactor shaft or transfer cask well while the partition between the spaces is perforated by force (e.g. fall of an item from a crane). In this case the coolant will leak from the SF pool to the bottom level of the perforated partition or down to +14.75 m at most, which is the transport channel bottom. Spontaneous perforation of the partition is not realistic. Evaluations of the described situations have shown that a critical assembly will not develop from a FA in the SF pool.

Concerning the possibility that safety criteria will be exceeded as a result of insufficient cooling of FA, in these situations the temperature of cladding may increase over 750 ^{o}C and radioactive material may subsequently be released into the reactor hall or into the environment. The mentioned process may be relatively fast (tens of minutes) and dangerous from the viewpoint of the established conditions for radiation safety. The determining conditions to establish a time reserve for corrective measures include the remaining coolant volume or coolant level after the defect initiation and the residual outputs of the individual fuel assemblies in the SF pool. Two scenarios have been evaluated – loss of coolant to the lowest possible level at +14.75 m in the SF pool and total hypothetic loss of coolant in the SF pool, with immediate adiabatic heating of the individual fuel assemblies by residual output, which is strongly conservative and unrealistic.

The first of the evaluated scenarios may be viewed as an event with a low frequency, which may occur 1x in the NPP's lifetime. The safe time to perform correcting measures for the given event is 2 hours, followed by a potential period of at least 3 hours before the FA cladding is damaged by the maximum residual output. Under the real conditions of residual output and coolant leakage the times to perform corrective measures will be significantly longer.

As for the second scenario, the extraordinary event is very unrealistic, which may be viewed as limit interference in the operation not foreseen by the design, but may potentially result in major release of radioactive materials. For this incident the minimum time to perform corrective measures is 30 min. Real times for safety measures at lower residual outputs will be longer and for a part of fuel assemblies the removal of heat may be achieved by natural air circulation without cladding damage.

Loss of the storage pool cooling

Residual heat generated in the fuel is removed from the coolant in the pool by a water cooling system which also maintains the coolant level in the pool at a prescribed level. To make sure that the mentioned process works as required the cooling system has been designed as two mutually independent cooling loops (one working loop, one backup), while the two loops are equal in terms of cooling the SF pool and both are designed to remove residual heat output of 8.14 MW from the pool, while the coolant temperature in the pool should be maintained at the operating level between 50 ^{o}C and 60^{o}C (in emergency conditions max. 70 ^{o}C). An initiation of a long-lasting defect of the cooling system (hours to tens of hours) is very little likely because the cooling function has a hundred percent complete process backup. Each line has a backup for the coolant circulation, power supply of pumps, there are design reserves to remove heat from the SF pool of substantial thermal capacity and, moreover, alternative procedures have been developed for abnormal situations.

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 licence for trial operation of ISFSF Dukovany. The approval was provided in the SÚJB Decision No. 245/95 of 24 November 1995.

Then followed Revision No. 2 of the above-mentioned report, from September 1996; it was reviewed, including other necessary documents, and SÚJB issued Decision 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 decision permitting to extend the operation of ISFSF Dukovany until 31 December 2010.

The Pre-operational Safety Report for ISFSF Dukovany has the following structure:

- Description of the location and surroundings of ISFSF Dukovany,
- Basic safety parameters and criteria,
- Data about the stored spent fuel,
- Design,
- Quality Assurance,
- Operating systems,
- Radiation protection,

- Safety analyses,
- Operation, operating inspections and maintenance,
- Waste management
- Accounting for and control nuclear materials,
- Physical protection,
- Decommissioning,
- Limits and Conditions.

From the viewpoint of safety aspect assessment the critically important chapter of the Safety Report is No. 9 – Safety Analyses, structured as follows:

- Safety under the design
  - Structural integrity
    - Calculations
    - Tests
    - Free fall from 9 m of height
    - Fall from 1 m on a pin
  - Undercriticality of a stored fuel assembly
  - Temperature parameters of cask during operation
  - Release of radionuclides from cask
  - Dose equivalent rate in cask surroundings
- Long-term behavior of cask components during storage
  - External factors during storage
  - Internal effects
- Safety during emergency conditions
  - Selection of emergency events and their justification
  - Initiation events
    - Internal events
      - Violation of conditions for heat removal
      - Defects during handling of loaded cask
      - Fall of filled cask
      - Internal flooding with water
      - Fire in ISFSF Dukovany
    - External
      - Fall of flying objects
      - Pressure wave
      - Earthquake
      - Floods, deluges
    - Beyond design accidents
      - Loss of cask tightness
      - Loss of cask neutron shielding
  - Course of the individual extraordinary events
    - Internal events
      - Violation of conditions for heat removal
      - Defects during handling of loaded cask
      - Fall of loaded cask
      - Internal flooding with water
      - Fire in ISFSF Dukovany
    - External events

- Fall of flying objects
- Pressure wave
- Earthquake
- Floods, deluges

▪ Beyond design accidents
- Loss of cask tightness
- Loss of cask neutron shielding

– Radiation consequences of extraordinary events
– Radiation burden during liquidation of accident consequences
– Emergency planning
  - Integration of the emergency plan for ISFSF Dukovany into the on-site emergency plan for EDU
  - Classification of extraordinary events
  - Emergency monitoring
  - Procedures for liquidation of emergency conditions
  - Practicing of emergency procedures in the EDU context.

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.

Within Pre-operational Safety Report for NPP Temelín analyses were performed in connection with the operation of SF pools, concerning particularly:

- The installation's ability to resist to external forces; this was verified by strength analysis of the supporting plate, in which the absorption part of a compact grid was installed in SF pool. The analysis concluded that the reduced stress level at any type of loading conditions or in any junction point did not exceed the permitted stress, and therefore the strength of the given node was sufficient,
- The installation's ability to assure continual cooling. A calculation of SF pool cooling after the installation of the compact grid verified sufficient cooling capacity for the pool in various potential operating regimes, using the existing systems for heat removal produced by SF placed into the grid. Three identical cooling systems are available for heat removal from SF pool, which may be interconnected so that none of them is firmly connected to one section of the pool. They enable both parallel cooling of all sections, potentially also with only a single system, as well as parallel operation of the systems. The cooling system for SF in SF pool is capable of removing all residual heat from the fuel assemblies, even under the most conservative assumptions anticipated by the design. Provided SF pool has at least 163 free positions for complete unloading of the core, the water temperature in SF pool will not exceed the required 50 °C even with only one cooling system in operation,
- Analyses of consequences of a heavy item fall into SF pool and recommendation of measures to their prevention. The example initiation event for the given area has been a fall of a transport channel hatch when moved by crane. The hatch has been selected as the worst alternative because it has the biggest weight of all items transported over SF pool, with a very small area of the bottom edge. The hatch is anticipated to fall down either on the empty SF pool grid or on the upper side of the stored SF assemblies or on upper side of hermetic cases. The cases may be either empty or filled with damaged fuel assemblies.

The calculation has proved that the structure of fuel assemblies and hermetic cases will prevent damage of fuel rods in fuel assemblies, if placed in hermetic cases. The biggest strength transmitted to the foundations is the same as if the hatch hit a hermetic case,

- Analysis of thermohydraulic conditions of the SF pool grid under normal conditions and during emergency unloading of the core. The analysis of thermohydraulic conditions in SF pool is addressed in a calculation of cooling, which initially establishes heat sources in SF pool based on residual thermal output of unloaded fuel assemblies. Evaluation of temperature conditions in SF pool is performed in two steps. The first step is an overall heat balance of SF pool with connected cooling systems; the balance provides for the known heat sources and cooling parameters the temperature of water supplied under the grid and the mean temperature of water collected from the upper part of SF pool. In the second step that follows, the temperatures are used as boundary conditions to determine the flow in a system of parallel, unequally heated channels in the grid and to determine local water temperatures at outputs from the individual channels. In case of the cooling systems failure the overall balance will provide information on an increase of the mean temperature of water in SF pool and also about the time of general boiling in the pool until all the water over the stored fuel assemblies evaporates. Subsequently, local evaluation may be performed to find out whether boiling occurs in a particular channel for a known temperature in the pool. Even in case of complete unloading of the core into SF pool, otherwise completely filled with SF, performed repeatedly 10 days after emergency reactor shutdown in the least favorable period at the fuel cycle end, the local output temperature from a channel containing fuel assembly with the maximum output will not exceed 54.4 °C with only one cooling system in operation. The cooling system is therefore with a significant reserve able to maintain the mean temperature of water over the grid below 70°C, which is the limit required for this emergency situation.

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, Re. 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 § 47 of Decree No. 195/1999 Coll. have been met as follows:

- Undercriticality is assured by placement of FA 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 casks for fuel transport are regularly inspected before any transport of FA. 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 once per 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

Undercriticality of the high-level waste 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 filled with water of various density. The high-level waste 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 60 % (180 MWd/kg),
  - Fuel IRT – 2M, 4-tube FA, enrichment 80 % wt. ^{235}U, burnup 55 % (350 MWd/kg),
  - Fuel EK 10, enrichment 10 % wt. ^{235}U, burnup 45 %.

7.6 Operation of Facilities

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

(i) the licence 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 licence 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 licence 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 Reports submitted by the Czech Republic under the Convention on Nuclear Safety, elaborated in September 2001.

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 shaft No. 1 (transfer cask shaft)

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,
- 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 loaded cask was introduced into ISFSF Dukovany on 5 December 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 2002 ISFSF Dukovany contained 3864 SF assemblies in 46 CASTOR-440/84 casks. The numbers of stored casks with fuel assemblies since 1995 are shown in Fig. 7.1.

The increased number of stored casks in Dukovany in 1996 – 1997 is due to the reimport 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 retrogressive 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 retrogressive flooding is a standard accessory for CASTOR-440/84 cask at NPP Dukovany and its use was at the time worldwide unique.

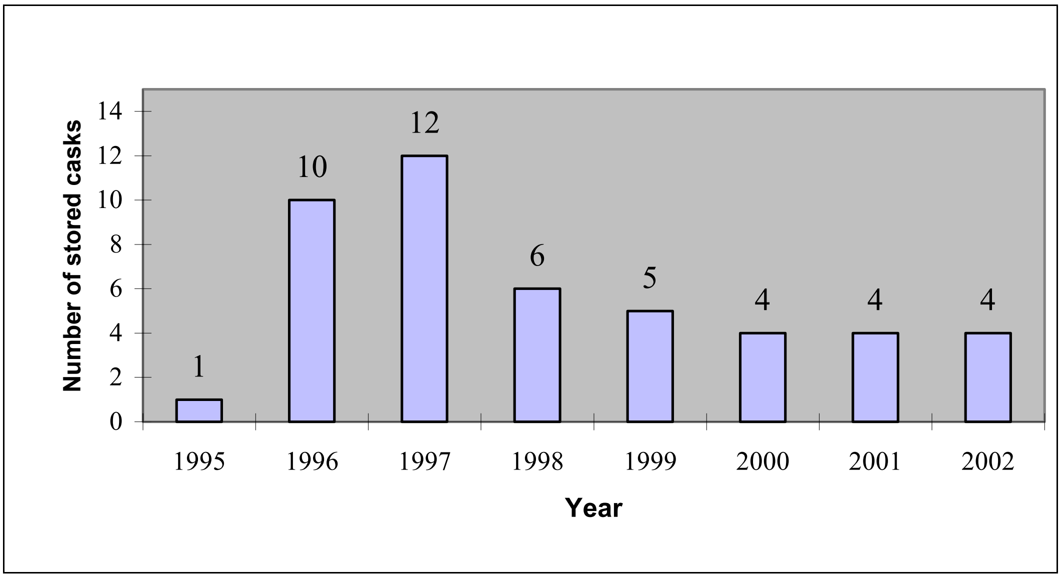

Diagram 7.1 Numbers of stored casks kept in ISFSF Dukovany

The operation of ISFSF Dukovany is performed in agreement with the operating procedure P181j, while all conditions shall be observed as specified in the decisions 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,
- tightness of casks,
- radiation monitoring of casks,
- moving of casks for fuel assemblies into the main production building,
- fire protection system devices,
- provision of supply and outlet of the ventilation air in the hall of ISFSF Dukovany,
- responsibilities of managers,
- personnel qualification,
- inspections and supervision,

- geometric arrangement of casks in the storage hall of ISFSF Dukovany,
- maximum temperature on the cask surface.

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 premises 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.

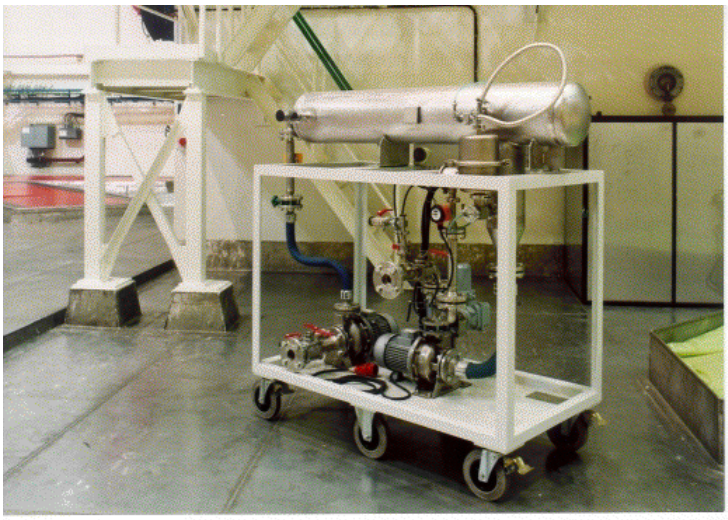

Fig. 7.4 Equipment for water re-flooding of CASTOR-440/84 cask.

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 casks, are displayed in the radiation monitoring central control room, where the parameters are continually checked.

System measuring pressure between the cask 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 both lids of each cask. The data are used to determine tightness of the casks 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 cask surface

Each cask 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 casks

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.

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 normal operation of ISFSF Dukovany results in a small quantity of solid RAW from protective means and waste from periodic maintenance of engineering equipment. In terms of contamination this solid waste is not radioactive. The waste is collected at ISFSF Dukovany into plastic bags and further segregated into:

- small burnable, pressable,
- small unburnable, non-pressable,
- small metallic.

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.

About 5 m^3 of liquid waste is generated every year from washing the floors and casks 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 inRAW 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 developed a 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 NI 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

In connection with a SÚJB requirement NPP Dukovany once a year on 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.

The evaluation report about the operation of ISFSF Dukovany is structured as follows:

- Course of handling of casks,
- Pressure between the lids of casks,
- Temperature changes,
- Radiation situation in the monitoring hall,
- Exposure of workers,
- Radiation situation in the surroundings of ISFSF Dukovany,
- Operability of the handling equipment,
- Wastewater monitoring,
- Operability of radiation monitoring systems,
- Evidence of passability of ventilation openings in the ISFSF Dukovany building,
- Evidence of heat capacity of the casks
- Checks, inspections,
- Status and efficiency of corrective measures,
- Visual inspection of pins and surface of the cask,
- Periodic inspections of pressure sensors.

7.6.1.2.6 Concept for Decommissioning of ISFSF Dukovany

The concept for decommissioning of ISFSF Dukovany is the same as for the planned 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 licences 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 spent fuel 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

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.

1) Activities by shift personnel for reactor commissioning, operation and shutdown are specified in the following documents:
    - Limits and conditions for reactor operation, Edition 2, Revision No. 2, Ref. No. 11114 T, 3/2001,
    - Safety and operational procedure for reactor shift personnel, Revision No. 2, Ref. No. DRS 914.
2) Procedures for design and construction of configurations in the core are provided in the following documents:
    - Program for construction of the core and refueling of LVR–15 reactor, Ref. No. DRS-826,
    - Program of the basic critical experiment for the LVR–15 reactor, Ref. No. DRS 827.
3) Activities during fuel handling are specified in the Program for transport, storage and fuel handling in the LVR–15 reactor, Revision No. 3, Ref. No. DRS 1054.
4) The inspections of selected equipment are specified in the Program of operating inspections for the LVR–15 reactor, Edition No. 2, Ref. No. 4025.08/801, 2/2000.
5) Professional training of the personnel is performed in agreement with the following documents:
    - Organizational procedure No. 2/1995, Revision of 1998, Training of selected personnel for the LVR–15 and LR–0 reactors,
    - Organizational procedure No. 3/1995, Revision of 1998, Curriculum for training of selected personnel for the LVR–15 and LR–0 reactors,
    - Organizational procedure No. 8/1999, System of employees training in radiation protection and nuclear safety, 1/2000,
    - Annual plan for the personnel department 801.
6) Procedures for radiation protection assurance are specified in the following documents:
    - Monitoring program for the research reactor LVR–15, Ref. No. DRS 974, 2000,
    - Specification of the controlled area in the building with the LVR–15 reactor, Ref. No. DRS 976, 2000,
    - Safety and operational procedure for STADOS, Ref. No. DRS 984, 2000,
    - Operating manual for the building with the LVR–15 reactor, Edition No. 2, Ref. No. DRS 955,
    - Organizational procedure No. 2/1999 Radioactive waste management, 7/1999,

- Organizational procedure No. 6/1999 Radiation protection assurance, 8/1999,
- Organizational procedure No. 2/2002 Accounting for ionization radiation sources, 4/2002,
- Organizational procedure No. 4/2000, Provision of personal protective means and aids,
- Organizational procedure No. 3/1999 Monitoring program for ÚJV Řež a. s.,
- Annual plan to maintain cleanliness and order.

7) Principles and procedures for emergency preparedness are specified in the following documents:

- Organizational procedure No. 1/1997 Assurance of fire protection,
- Organizational procedure No. 1/2000 On-site emergency plan for ÚJV Řež a. s.
- On-site emergency plan for workplaces „Research reactor LVR–15“, Ref. No. DRS 1002, 12/2000,
- Organizational procedure No. 9/1999 Assurance of emergency preparedness in ÚJV Řež a.s.,
- Intervention instructions for operation of LVR–15, Ref. No. 1029, 6/2001.

8) Metrology is provided for in agreement with the organizational procedure No. 5, Metrology rules, Edition No. 2, Revision No. 1, 2/2002.

9) Modifications of the limits and conditions are performed in agreement with the working procedure “Preparation and approval of limits and conditions for operation of the LVR–15 reactor, Ref. No. DRS 928.”

7.6.3.2 Building 211/8 – HLW Storage Facility

The following list provides an overview of working and technological regulations associated with operation of the HLW storage facility:

- Standard working procedures for the operational regimes of the high-level waste storage facility, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000);
- Handling of shielding panels, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Storage of spent fuel type EK-10, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Storage of solidified high-level waste in the high-level waste storage facility, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Storage of non-standard high-level waste in the high-level waste storage facility, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Storage of radioactive waste from the attested samples program in the high-level waste storage facility, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Storage of fuel assemblies of the type IRT–M in the high-level waste storage facility, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Operation of the ion-exchanger station for the shielding water in the tank, including monitoring and evaluation of physical and chemical properties of water, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Leakage indication in IRT-M fuel assembly and its isolation, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),

- Indication of water in the inspection tank of the shielding tank (quality assurance of classified equipment) in the high-level waste storage, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Operation of the high-level waste storage facility in winter season, a part of the Operating Manual for the High-level Waste Storage Facility, (18. 5. 2000),
- Technological procedure for the handling cask K 1xIRTM in the High-level Waste Storage Facility, (18. 5. 2000),
- Technological procedure for the handling of cask for radioactive waste transport from the attested samples program into the High-level Waste Storage Facility, (18. 5. 2000),
- Technological procedures for operation of demineralized water station MIX 1000, (18. 5. 2000),
- Program of operating inspections in the High-level Waste Storage Facility (including monitoring of shielding tank leakage – selected equipment), 25. 5. 2000,
- Procedure for execution of dosimetric measurements of solid radioactive waste, 5. 2. 1999,
- A list of fuel assemblies for the 3rd stage of spent fuel transport from the reactor into the High-level Waste Storage Facility, Ref. No. 921,
- Emergency rules for transport of spent fuel IRT–2M from LVR–15 reactor building into the High-level Waste Storage Facility, Ref. No. DRS 916,
- Proposal to classify transported spent fuel IRT–2M into category III from the viewpoint of physical protection, Ref. No. DRS 922,
- Transport instructions for spent fuel transport from the LVR–15 reactor building into the High-level Waste Storage Facility, Ref. No. DRS 915,
- Method of radiation protection assurance for transport of spent fuel IRT–2M from LVR–15 reactor building into the High-level Waste Storage Facility, Revision No. 2, Ref. No. DRS 917,
- SÚJB Decision No. 392/98 about licence to transport spent fuel,
- SÚJB Decision No. 317/98 about approval of the transport cask TOS K–1x IRTM for spent fuel, Revision No. 1, Assigned Code No. CZ/003/B(M)F–85,
- SÚJB Decision No. 12253/2002, Limits and conditions for HLW storage operation,
- SÚJB Decision No. 15479/2002, Operation licence for HLW storage.

7.7 Disposal of SF

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

The Czech Republic anticipates development of a DGR in granitic rock formations after 2065. Based on earlier geologic data about 30 potential locations have been identified in the Czech Republic. The repository is expected to accommodate all RAW that cannot be deposited in near-surface repositories, SF classified as RAW and alternatively also HLW from potential retreatment 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 1787 t HM on condition that all the units will be in operation for 40 years.

In 1998 – 1999 another alternative for SF disposal was considered in non-dismounted condition and non-shielded storage 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 storage casks should be surrounded by a bentonite layer and vertically placed in tunnels on a granite massif, about 500 m under the surface.

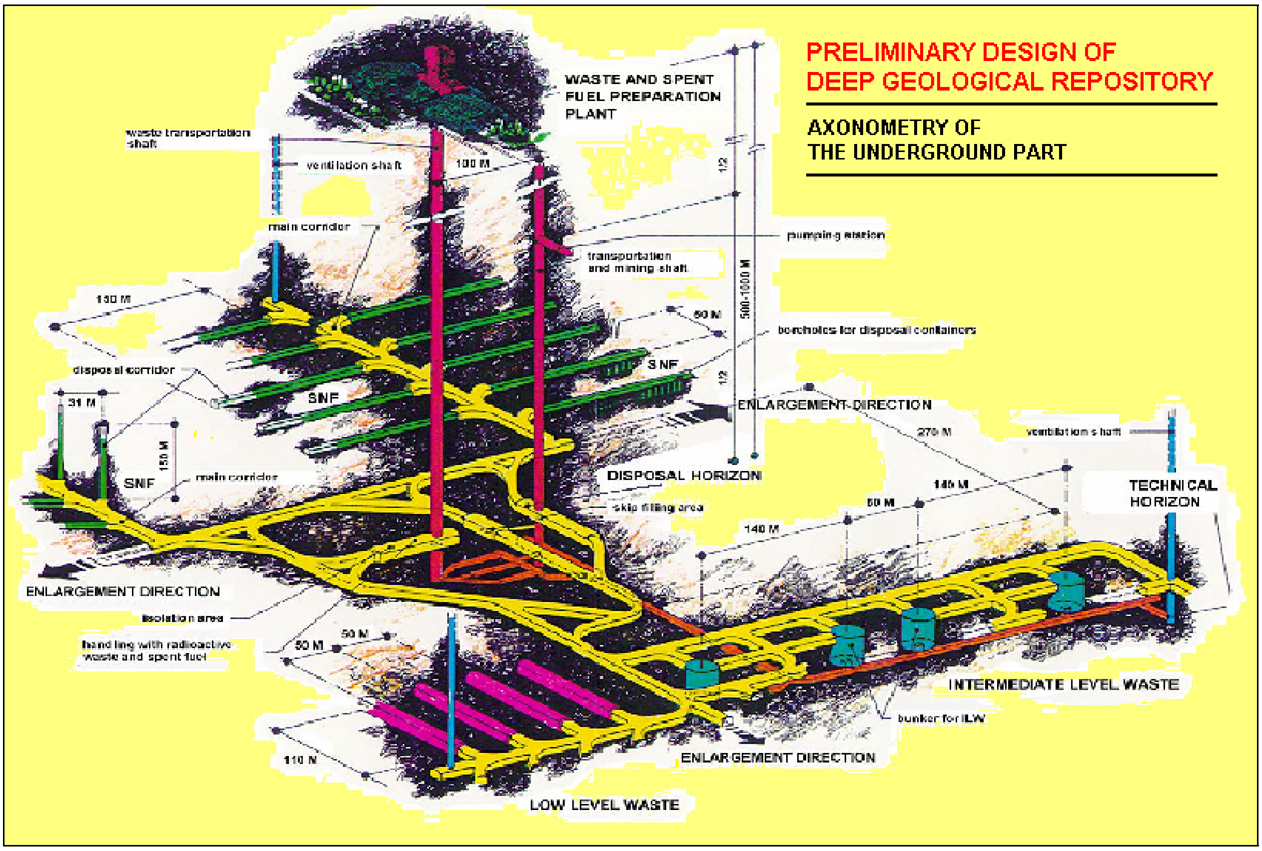

Fig. 7.6 An axonometric view of the deep repository underground part

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

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 § 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 § 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.

Decree No. 195/1999 Coll. in § 47 also 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 § 18 paragraph 1 letter d) positively requires to keep generation of RAW and SF to the minimum necessary level.

Mutual links between the individual steps of waste management are described in § 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 the following activities.

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. 29/96. 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 § 46 paragraph 2 of Decree No. 307/2002 Coll., saying that: *„In radioactive waste management the radiation protection shall be assured in the same manner and scope as for other radionuclide sources, unless the respective licence expressly establishes otherwise.“* In the Czech Republic no RAW management shall be permitted without a licence (§ 9 of the Atomic Act) issued by SÚJB. Before the licence is issued the applicant shall, among other things, demonstrate in the document required under the Atomic Act, his ability to assure radiation protection in the scope and at the level required by the Atomic Act and its implementing regulations. Before the licence is issued the assurance of radiation protection is verified by inspections.

Concerning the requirement to avoid actions that impose practical impacts on future generations or impose undue burdens on future generations, provision of § 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"*

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 licence 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 licence for RAW management under § 9 paragraph 1 letter j) of the Atomic Act. The licence 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,
- systems for storage of liquid RAW,
- systems for conditioning of liquid RAW,
- systems for collection, storage and conditioning of solid RAW.

Systems for treatment of liquid RAW include:

- treatment plant for SF pool water SVO 4,
- treatment plant for boric acid SVO 6,
- treatment plant for wastewater SVO 3.

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

Systems for storage of liquid RAW include:

- 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 the evaporatoration,
- 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 saturated sorbents and ion exchangers.

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

The systems for conditioning of liquid RAW represent a technological node for concentrate solidification. The system is common for all the 4 reactor units.

Collection, storage and conditioning of solid RAW consists of a segregating workplace and storage of solid RAW. Each subsystem is common for the reactor units 1 and 2 and for units 3 and 4.

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 shaft 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 about 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 treatment (bituminisation). In the solidification system of liquid RAW the concentrate is immobilized in bitumen, i.e. into a form suitable for permanent disposal. The main process equipment is a filter 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.

The design of RAW management in EDU does not enable release of solid waste from the main production building directly to the environment. Provided some solid waste is generated it is transported for treatment, treatment or storage into BAPP, which is part of the main production building. Due to the changes in the legislation regulating solid radioactive waste, in agreement with the program aimed at minimization of solid RAW, EDU has introduced a system for the waste release into the environment based on official measurements. Waste meeting criteria specified in Decree No. 307/2002 Coll. is released to 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 licence was issued for their trial operation. At the same time a licence was issued for RAW management under § 9 paragraph 1 letter j) of the Atomic Act. Both the licences have been issued for a limited period of time. Before their expiry the trial operation at the nuclear power plant will be evaluated and a licence for permanent operation will be issued for permanent operation. The operator in agreement with internal quality assurance documents regularly evaluates the safety of facilities for RAW management.

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

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

The RAW management system includes the following technological parts:

- treatment of liquid radioactive media, which includes:
  - treatment plant for SF pool water SVO 4,

- treatment plant for impure condensate SVO 6,
- treatment plant for wastewater SVO 3.

- 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.
- collection, storage and conditioning of solid RAW includes a segregating and fragmentation workplace and storage of solid RAW.

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 BAPP, which provides for discharge, making up and treatment of water from the reactor shaft 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 treated 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 BAPP. 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 about 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 interim storage of liquid RAW serves to accumulate and store concentrated RAW before further treatment (bituminisation). One technological node includes tanks with sorbents to store sorbents from all filtration stations in HVB and BAPP, another technological node includes tanks with concentrate containing radioactive concentrate from SVO 3 evaporators 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 permanent 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.

The design of RAW management in ETE does not enable release of solid waste from the main production building directly to the environment. Providing some solid waste is generated, it is transported for treatment, treatment or storage into BAPP.

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/y and annual effective dose equivalent for individuals from a critical group of population at 250 μSv/y. All this is demonstrated in documents supporting the application for a licence to operate a repository (particularly in safety analyses from which limits and conditions for the repository operation are derived) under § 9 paragraph 1 letter d) of the Atomic Act and in documents supporting the application for a licence to manage RAW under § 9 paragraph 1, letter j) of the same Act. Before issuing the licences 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 former limestone mine Richard II (inside Bídnice hill - 70 m under the ground level). 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 16 000 m^3, while the capacity for waste disposal is about a half of this 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 stored casks 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 licence issued by SÚJB.

Fig. 8.1 A view into a storage chamber in RAW repository Richard

8.2.3.2 Repository Bratrství

The repository is designed exclusively for waste containing natural radionuclides. The repository had been used until 2001 and its operation was permitted under the legislation valid in 1981. Since 1997, when the new Atomic Act came into force, additional important information has been provided (geology, hydrogeology, geochemistry, geotechnic etc.) and the information has been used to conduct repeated safety analyses in order to specify the maximum quantity of wastes that may be disposed in the facility.

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 1000 m^3. The repository started operating in 1974. The mine is situated in a water-bearing crystalline host rock 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. Currently, detailed safety analyses are being performed in order to decide about the future operation of the repository.

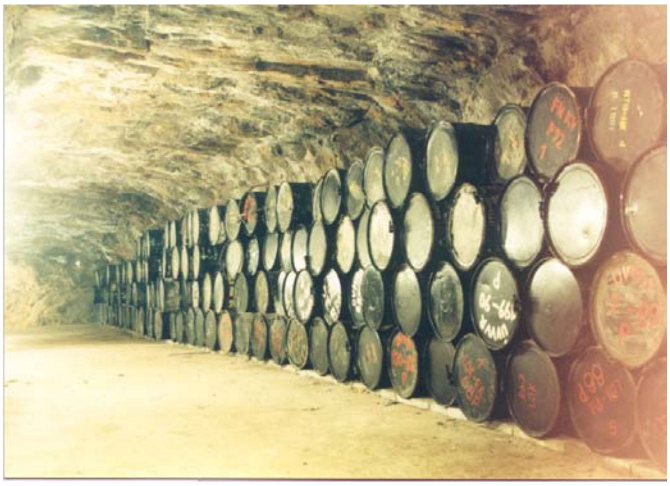

Fig. 8.2 A view into a storage chamber in the repository Bratrství

8.2.3.3 RAW Repository Dukovany

Fig. 8.3 An overall view of RAW repository Dukovany

RAW repository Dukovany has been developed at the NPP Dukovany site to dispose 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 (about 180 000 pcs of 200-liter drums) is sufficient to accommodate all RAW from NPP Dukovany and NPP Temelín, provided the waste meets acceptance criteria 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 operation is based on a licence for operation issued by 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 1600 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.

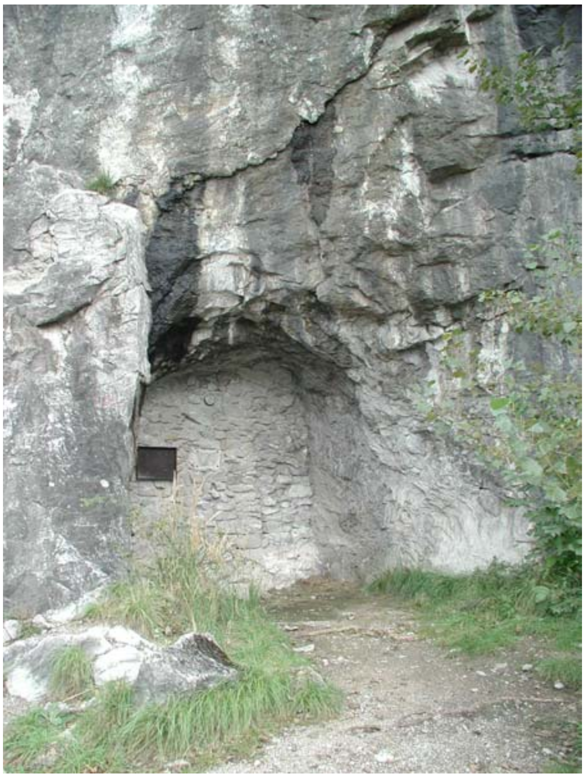

Fig. 8.5 Secured entrance into the Hostím repository

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-lived radionuclide sources and chemical wastes were removed from the repository. Based on a conservative evaluation of the documents and radiation monitoring it was calculated that the RAW inventory in the repository was in 1991 as follows:

- 10^{11} Bq ^{3}H,
- $2.0\text{x}10^{10}$ Bq ^{14}C,
- $1.3\text{x}10^{10}$ Bq ^{137}Cs,
- $1.3\text{x}10^{10}$ Bq ^{90}Sr,
- $5.8\text{x}10^{8}$ Bq ^{60}Co,
- $3.3\text{x}10^{7}$ Bq ^{226}Ra,
- $1.9\text{x}10^{6}$ Bq ^{63}Ni,
- $1.5\text{x}10^{6}$ Bq ^{204}Tl,
- $1.1\text{x}10^{5}$ Bq ^{147}Pm,

while other radionuclides were present in negligible quantities. The activity of short-lived radionuclides as established in 2002 was below 10^{11}Bq.

In 1990 – 1991 a hydrogeologic monitoring system of institutional inspection was developed and SÚRAO has operated it. 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.

8.2.4 ÚJV Řež a. s.

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

- Building 241 – RAW Management Facility Velké zbytky with technology for treatment and conditioning of radioactive waste,
- Building 211/8 – High-level waste 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 rest of past practices and have been gradually removed. They include:

- Building 211/6 – Reloading place of radioactive wastes,
- 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 treatment and conditioning of radioactive waste:

- FDS – equipment 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 pressing of solid compresible RAW – low-pressure screw mechanical press for pressable RAW (paper, PE, rubber, cellulose wadding, etc.),
- Evaporation system for concentration of liquid RAW – to treat liquid RAW produced mostly by research facilities within ÚJV Řež a. s.,
- Conditioning 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 pressing of solid pressable RAW – a new hydraulic press will be introduced in 2003,
- Evaporation system to concentrate liquid RAW – the system was introduced only recently and no steps are necessary to improve its safety,
- Treatment of solid and liquid RAW by cementation – will be provided with new technology in the future.

In addition to the above-mentioned technologies, Building 241 also includes old process equipment, already decommissioned. There are e.g. old evaporation system for concentration of liquid RAW, storage tanks etc. The technology forms a part of old environmental load to be liquidated in the nearest future.

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 m high. Inside the space it is divided into eight concrete square-shaped boxes to store solid RAW and SF EK–10 in dry concrete casks. Two cylindrical tanks are used for SF IRT–M. The tanks have 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 measuring the 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 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.

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 NI 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 selected 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 licence in agreement with § 9, paragraph 1, letter a) of the Atomic Act from the viewpoint of nuclear safety and radiation protection. The preconditions for the licence issuance under § 13 of the Atomic Act are :

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

An application for the licence to site a NI 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 NI 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 termination of operation;
  - 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 recommendation.

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 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 NI to assure nuclear safety, radiation protection and emergency preparedness and, particularly in Decree No. 215/1997 Coll., on criteria for siting of NI 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 the 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 NI 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 § 4 paragraph 4 requires for operating NI as part of re-assessment after a certain period of time or as part of periodic inspections of safety documents, to reassess the effect 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 § 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-border 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 neighbouring 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 NI 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.

8.3.1.1 Geographic Location

The location of NPP Dukovany is in the southeastern part of the Vysočina region (formerly the district of Třebíč), southwest of Brno on the right bank of the Jihlava river. Its geographic location in the Czech Republic is shown in the map in Fig. 1.1 (see Chapter 1). The plant is situated 45 - 50 km from the state border with Austria. The ground relief in the plant's surroundings is rugged in the northern part with the Jihlava river valley, in the southern part it is flat. The elevation above the sea level ranges from 369 to 711 m. There are five small towns in the surroundings of the plant - Třebíč, Náměšť nad Oslavou, Moravské Budějovice, Moravský Krumlov and Jaroměřice nad Rokytnou. The city of Brno with the population of approximately 500 000 is about 35 km to the northeast. The number of population living within 20 km of the plant is about 105 000. Otherwise the territory is sparsely populated with prevailing small rural settlements.

The location was selected to minimize potential interactions of the NI with the surroundings. Therefore there are no big industrial facilities or busy transport routes in the plant's immediate vicinity. The density of industrial facilities in the surroundings of NPP Dukovany is significantly smaller than in the other parts of the country. The immediate vicinity of the plant is positively of agricultural nature with only minor industrial facilities.

8.3.1.2 Seismic Protection

Seismic evaluation was performed for a circle with the center in the plant and with the radius of 200 km.

Geologic investigations and knowledge of subbase of the cooling towers foundations are considered sufficient, and the information about the space under the main production buildings I and II with ancillary buildings is even considered to be complete. The buildings in the seismic resistance category I (such as the main production building) are based in a very high quality bedrock with the underground water level below the foundation level. The high quality bedrock of the main production building corresponds to the very high surface spring constant of elastic bearing at 200 MPa/m in the vertical direction and 140 MPa/m in the horizontal direction. Geologic maps, geologic profiles and characteristics of the drills are provided in the appendices of reports used to elaborate the Pre-operational Safety Report for NPP Dukovany, revision 1.

Based on the historical data the biggest potential impacts of an earthquake in the Dukovany location may be expected from Alpine epicenter areas. The analyses which took into account both sizes of the biggest potential quakes and the least favorable intensity attenuation with distance in the direction from an epicenter to Dukovany have shown that on purely theoretical basis the maximum macroseismic activity expected in the location is 6^{o} on the Medvedev-Sponheuer-Kárník scale for evaluation of macroseismic effects on an earthquake (hereinafter MSK–64). The calculation of a seismic risk has provided the limit level of macroseismic intensity of 5.8^{o} MSK–64, which should not be exceeded even in the interval of 10 000 years.

The performed analyses have also confirmed the lack of any cases of local tectonic quakes. There are even no records of observed effects of any earthquakes for the municipality of Dukovany. The nearest local quakes occurred in the area of Jindřichův Hradec where epicenter intensities did not exceed 5^{o} MSK–64 and their macroseismic fields failed to overlap the area of Dukovany. Based on the above-mentioned and using the most conservative approach the following seismic characteristics may be concluded:

- the design earthquake equals to the biggest potential observed earthquake in the location in the historic time, i.e. 6^{o} MSK–64,
- the maximum calculated earthquake equals to the maximum upper estimate of the biggest potential expected earthquake, i.e. 6^{o} MSK–64 + 0.5^{o} MSK–64 (error in the determination of intensity levels).

The above-mentioned assessment positively implies that considering the totally seismically quiet area and the high-quality bedrock NPP Dukovany cannot be endangered with a seismic event. Still, for safety reasons, the maximum conservative approach has been used. In agreement with IAEA recommendations and based on the above-mentioned results, the levels established for the Dukovany location are SL–1 at 6^o MSK–64 and SL–2 at the acceleration 0.1 g (which in the Central European conditions corresponds to 7^o MSK–64, i.e. the intensity higher than the most conservative estimate of the maximum calculated earthquake).

8.3.1.3 Protection against Floods and Unfavorable Climatic Effects

The biggest waterway in the vicinity is the Jihlava river north of the plant, which supplies process water for the plant and to which the plant's wastewater is discharged. NPP is situated about 100 m over its maximum level. A system of waterworks Dalešice – Mohelno has been developed in the river which serves as a re-pumping hydroelectric plant. The annual average flow rate of the Jihlava river at the inlet into the reservoir Dalešice is 6 m^3s^{-1}.

An analysis of the actual and predicted floods has shown that the NPP Dukovany location has not been and is not endangered by floods.

A particular attention has been paid to specific knowledge of the meteorological situation in the NPP vicinity which is necessary to establish the impact of cooling towers operation and to assess spreading of radioactive materials. The NPP is situated in an Atlantic-continental temperate climatic zone of the Northern Hemisphere. Air masses of oceanic and continental origin alternate over the location which is associated with frequent passing of atmospheric fronts. Specific meteorological measurements and observations of the location have been performed at the meteorological observatory of the Czech Hydrometeorological Institute in Dukovany since June 1982 without interruption. The station performs regular synoptic and climatologic measurements using standard meteorological devices.

The design took into account unfavorable meteorological conditions, such as windstorms, precipitations and extreme temperatures.

8.3.1.4 Protection against Airplane Crash

Airspace above the nuclear power plant has been proclaimed prohibited for all flights in the document "Flight Information Manual" which is obligatory for all users of the Czech Republic airspace.

The nuclear power plant is located in a close vicinity of military airfield Náměšť (10 km as the crow flies). The space up to 1500 m with the radius of 2 km radius around Dukovany is prohibited for any flights.

Analyses have shown that the plant is protected against effects caused by a military and civil aircraft crash. Assessment of the effects was performed in accordance with the International Civil Air transport Organization (ICAO) guidelines. Results of the calculations have shown that an aircraft crash will not cause inadmissible destruction of RAW management facilities because their civil engineering structures important for nuclear safety are sufficiently resistant against possible impacts of such a crash.

8.3.1.5 Protection against Explosion Pressure Waives

There is the second class road No. 152 next to NPP Dukovany linking Brno, Ivančice, Dukovany, Znojmo, Jaroměřice nad Rokytnou, Moravské Budějovice. Other roads in the vicinity have less busy traffic. Analyses have shown that even in the case of very improbable explosion of a transport vehicle carrying a dangerous freight the plant's safety will be not affected.

The plant has one-track railway from the eastern direction to Moravský Krumlov and Brno. The probability of a train accident both in present and in long-term prospect is practically equal to zero.

There are no other external sources of potential danger in the plant's vicinity.

8.3.1.6 Protection against Influence of Third Parties

The plant's design safety features include the protection against influence of third parties. Safety systems, as well as their power supplies, are redundant and spatially distant. This engineered safety is supplemented with a system of technical, organizational and regime measures which should prevent inadmissible influence of third parties.

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.

8.3.2.1 Geographic Location

The Temelín location was selected at the turn of the 1970 s and 1980s based on evaluation of the territory parameters under the criteria specified in the then valid Edict No. 4/1978 Coll. Its geographic location in the Czech Republic is shown in the map in Fig. 1.1 (see Chapter 1). The plant is situated 45 - 50 km from the state border with Austria and Germany. The nearest permanent settlement near the NPP is Temelín municipality 2 km northwest of the plant. Týn nad Vltavou with the population 7900 is 5 km from the plant, Vodňany with the population of 6 400 is 14 km from the plant and České Budějovice with the population of 100 000 is 25 km from the plant. According to the most recent census the number of population within 30 km of the plant is about 256 000. Otherwise the territory is sparsely populated with prevailing small rural settlements.

The location was selected to minimize potential interactions of the NI with the surroundings. Therefore there are no big industrial facilities or, except the transit gas line, busy transport routes in the plant's immediate vicinity. The density of industrial facilities in South Bohemia is significantly smaller than in the other parts of the country. The immediate vicinity of the plant is positively of agricultural nature with only minor industrial facilities.

According to the information provided by the Českobudějovický regional authority no industrial activity development is planned within a ten-kilometers zone around the plant by 2020.

8.3.2.2 Seismic Protection

Despite the fact that the Czech Republic territory belongs among the geologically well-surveyed territories, another detailed geological assessment of the area up to the distance of 30 km had been performed in relation with the nuclear power plant siting. Original geological surveys performed during 1980's were supplemented with additional surveys in 1991-1994 in agreement with the IAEA recommendations.

Geological underlying rock of the locality is represented by the South-Bohemian branch of Molanubikum and South-Bohemian basin. Both units belong to the Bohemian massif which had been created by the end of Paleozoic Era in the final phase of Varisk rockforming cycle. The most frequent rocks here are granite and gneiss. The plant site has a rock substratum, the reactor buildings are positioned on a homogeneous block of rock, bigger than 500 x 500 m. Geomechanically, the plant underlying rock has a sufficient foundation bearing capacity for buildings and equipment of the nuclear power plant.

Seismic assessment has been performed for the whole area relevant to the plant, defined by a circle of 300 km radius around the nuclear power plant in its center. The biggest part of this area lies within the Bohemian massif territory, in the south and southeast it reaches the Alpine-Carpathian region. Moldanubikum under the nuclear power plant is the oldest and strongest part of the Bohemian massif. The seismic risk value is determined by Alpine earthquakes. Results of the seismologic analyses have shown that there are no known cases of local tectonic shocks.

The catalogue of earthquakes has been amended in agreement with the IAEA 50-SG-S1 Rev. 1 recommendations. The catalogue report contains records since 1550 and is one of the important reference documents in the Pre-operational Safety Report.

The assessments which consider both the biggest possible quakes from epicenters within the concerned area and the most adverse attenuation of intensities with distance between the earthquake epicenter and the plant, imply that the limiting value of macroseismic intensity which should not be exceeded with 0.95 probability even within a period of 10 000 years is $6{,}5^{o}$ MSK-64, which in the conditions of Central Europe corresponds to 0.1 g. Design acceleration was 0.1 g which fully conforms to the IAEA recommendations issued in 1991. These values have been used both in the design and construction of buildings and equipment required to ensure the reactor safe shutdown, removal of residual heat and prevention of the radioactive substances release (1st category of seismic resistance).

8.3.2.3 Protection against Floods and Unfavorable Climatic Effects

Operation of the power plant is associated with the Vltava river from which process water is taken and into which the wastewater is discharged. The Vltava river is the main axis of the Czech river system with a number of water reservoirs built earlier – the so-called Vltava cascade. A significant benefit provided by the cascade reservoirs is equalization of the minimum flows. For the purposes of the NPP Temelín, two water reservoirs were added to this cascade: Hněvkovice which provides process water supply and Kořensko to mix the discharged wastewater with Vltava water.

Analyses of actual and predicted floods have shown that floods have never endangered the plant's site. The main plant buildings housing equipment important for nuclear safety are built at the altitude 510 m. The assessment of historic extreme flows implies that the plant area is approximately 150 m above the maximum level. The site has been also assessed from the viewpoint of potential destruction of water reservoirs on upper course of the Vltava river. A breakthrough of the Lipno I dam would result in about 1460 m^3s^{-1} in Hněvkovice profile which would not affect either the Hněvkovice dam or the pumping station or process water.

A particular attention has been paid to specific knowledge of the meteorological situation in the vicinity of the nuclear power plant to determine the influence of cooling towers operation and to assess radioactivity spreading. The nuclear power plant is situated in the Atlantic-continental area of temperate climatic zone of the Northern Hemisphere. Air masses of oceanic and continental origin alternate over the location which is associated with frequent passing of atmospheric fronts (on average 125 fronts a year). Prevailing are meteorological situations with the fronts coming from the west and, less frequently, from the north. Specific meteorological measurements on the site started at the time when the meteorological observatory was built. The observatory is located 3 km northwest from the nuclear power plant. The measurements begun in April 1988 and have been carried out since January 1989 without interruption.

The design took into account unfavorable meteorological conditions, such as windstorms, precipitations and extreme temperatures.

8.3.2.4 Protection against Airplane Crash

An airspace with the radius of 2 km and up to 1500 m above the NPP has been proclaimed prohibited for all flights in the document ”Flight Information Manual”. The nearest aviation route is 18 km from the plant. The aviation traffic has no effect on the NPP. The military airfield in Bechyně, 25 km from the plant, has been closed.

Analyses have shown that the plant is protected against effects caused by a military and civil aircraft crash. Assessment of the effects was performed in accordance with the International Civil Air transport Organization (ICAO) guidelines. Results of the calculations have shown that an aircraft crash will not cause inadmissible destruction of RAW management facilities because their civil engineering structures important for nuclear safety are sufficiently resistant against possible impacts of such a crash.

8.3.2.5 Protection against Explosion Pressure Waives

There are 3 branches of the transit gas line of 1400, 1000 and 800 mm diameter in the plant’s vicinity. The minimum distance from the plant reactor buildings is about 900 m. The transit gas line transports natural gas. Analyses have shown that even the maximum possible postulated accident on the gas line (simultaneous breaking of all the three branches) will not impair functions of the buildings and technological equipment. To reduce probability of accident occurrence on the line and to reduce potential consequence of such an accident a number of measures have been adopted. They include subsequent introduction of spherical valves that reduce sections of the line that may be separated and also a system for gas leakage monitoring. SÚJB favorably assessed related calculations and analyses performed by professional organizations and research institutes.

At the southeastern edge of the site there is a busy second-class road No. 105 České Budějovice - Týn nad Vltavou; other roads in the plant immediate vicinity are less frequented. 10 km from the plant there are two sections of international roads also used for transportation of hazardous freights (ARD). However, analyses have shown that even in the case of a very improbable explosion of a transport vehicle carrying a dangerous freight, the plant safety will not be affected.

The nearest railway situated 1.4 km from the plant is the local railway line Číčenice - Týn nad Vltavou with passenger and goods trains. Passenger trains are very infrequent. The probability of a train accident with dangerous goods, both at present and in long-tern prospect, is practically equal to zero.

8.3.2.6 Protection against Influence of Third Parties

The plant’s design safety features include the protection against influence of third parties. Safety systems, as well as their power supplies, are redundant and spatially distant. This engineered safety is supplemented with a system technical, organizational and regime measures which should prevent inadmissible influence of third parties.

8.3.3 SÚRAO

Selection is being performed for future deep repositories of HLW and SF. The development of DGR in the Czech republic is expected in granitic rock formations. Based on earlier acquired geological data 30 locations had been identified in the Czech Republic, while eight of them were selected by 1998 for more detailed investigation. Recommendation of the locations is not contradictory to any of the excluding criteria under the current legislation, however, for some of them conflict of interests need to be addressed. Therefore an independent review of the selection is being performed now and the options of potential placement of deep repositories in other rock systems are being verified. The review will be completed in the first quarter of 2003 and based on its outcome locations will be selected to perform geological surveying.

It is anticipated that the repository will accept all RAW that cannot be deposited in near-surface repositories, SF once it is declared a waste and HLW from NPP decommissioning, alternatively also HLW from potential retreatment of SF from EDU and ETE, and, if applicable, SF or HLW from other sources.

The process of preparation of a deep repository in the Czech Republic will take place in four stages:

- Surveying of candidate locations, evaluation of their suitability and proposed structure of engineering barriers,
- Selection of the final location and the corresponding structure of engineering barriers,
- Confirmation of safety of the deep repository with safety analyses,
- Proposal of a technical solution of the engineering equipment and civil engineering objects, infrastructure and architectural design of the facility,
- Development of the respective documents and obtaining of required approvals associated with the project (land use plan, zoning and planning decision, building permit – see the Building Act and Mining Act, impacts on the environment, etc.).

The project of the deep repository development and operation will be based on modules, i.e. it will take into account gradual development of new nuclear sources and subsequent demand to extend the repository for SF and high-level waste, as well as the space to deposit other than HLW. The deep repository is expected to be put into operation in 2065.

Siting of the existing RAW repository was performed within the framework of procedures to obtain planning and zoning decisions under the valid legislation. Safety of the repositories has been reassessed in agreement with the Atomic Act and its implementing regulations, as required for the siting, design, construction and operation of the repositories.

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 High-level waste storage facility) took place within the proceedings to site the entire NI 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; at the design stage, technical provisions for the closure of a disposal facility are prepared;
(iii) 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 NI 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 selected 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 NI is an activity subject to a licence by SÚJB in agreement with § 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 licence for construction of a NI under § 13 paragraphs 5 and 6 of the Atomic Act:

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

An application for a licence 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 NI
- Assessment of nuclear waste generation and nuclear waste management during commissioning and operation of the installation or workplace being licenced;
- Concept of safe termination of operation and decommissioning of the installation or

workplace being licenced, 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 selected equipment.

- Proposed method of physical protection assurance.

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

8.4.1 Nuclear Power Plant Dukovany

EDU is planning a new plant to treat sludge and ion exchangers, i.e. its design and construction.

Decommissioning of facilities for RAW management is performed in agreement with the concept of EDU decommissioning. Proposals of the decommissioning plans for the RAW management facilities, and on as-needed basis also technical measures, are taken into account already in the designing stage as it was and has been required by the valid Czech legislation (formerly in the Decree No. 67/1987 Coll., now in Appendix B to the Atomic Act).

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 on collection, segregating and treatment of radioactive wastes. The experts and ČSKAE came to the following findings:

- There is a significant difference in quantities of treated RAW for NPP Temelín design and similar plants in the West (the original design failed to anticipated consistent separation of liquid non-active and active media at the place of their generation and the media were mixed in the process of their removal. As a result, there was a large volume of liquid waste that had to be treated as radioactive waste),
- The original design failed to anticipate segregating of solid wastes (all the materials introduced into the controlled area, including non-active items, were viewed as contaminated).

These findings lead to a thorough revision of the entire system for RAW management.

The purpose of the changes in the design were:

- to increase operational reliability of the facility, reduce requirements for maintenance,
- to minimize the quantity of generated radioactive wastes,
- to maintain or improve efficiency of all barriers, common for all the operations, against release of radioactive materials into the surrounding of the plant,
- to reduce volume of treated RAW by segregating,
- to create preconditions for easier decommissioning of the power plant.

The following changes were implemented in the process of construction:

- Air filters – all Soviet FARTOS aerosol filters have been replaced for supplier-related and functional reasons with a more efficient filtration central station made by a local company, which has been used for the same purpose in the plant's air-conditioning systems. An expansion vessel has been added before the air-conditioning filtration unit to eliminate pressure surges,
- Organized storage of solid RAW – the originally unorganized throwing of RAW into storage rooms has been changed into organized storage with its potential retrieval. The stored waste is well defined with various levels of neutron activation, depending on their operational position in the reactor core - neutron sensors, ionization chambers, thermocouples and attested samples (except for the attested, the items were supplied by WESTINGHOUSE). The handling procedure for this RAW has been addressed starting at the time of their removal from the functional positions on the reactor until their placement. The waste will be placed into rooms in cylindrical containers with the diameter of 30 cm. The rooms are shielded with 1.5 m thick concrete walls and covered with 1.5 m thick iron-concrete ceiling, the entry openings in the ceiling are closed with conical shielding plugs. The implemented solution under the modified design has resulted in an increased safety of the storage system for low- and intermediate-level RAW, in agreement with SÚJB requirements,
- Segregating and fragmentation workplace – a central workplace has been developed for segregation, treatment and storage of solid radioactive waste, which involves collection, transport, storage, segregation, treatment and their transport to a repository. The main reason for the change has been the economic aspect of he transport and storage (volume reduction),
- Bituminisation line – the original Soviet design of the bituminisation line has been replaced with a French universal bituminisation technology by SGN in consortium with KPS Brno.

ETE is also planning permanent decommissioning of facilities for RAW management operated by the plant. Proposals of the decommissioning plans for the RAW management facilities, and on as-needed basis also technical measures, are taken into account already in the designing stage as it was and has been required by the valid Czech legislation (formerly in the Decree No. 67/1987 Coll., now in Appendix B to the Atomic Act).

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 mines 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. A new access route was developed in 1962 – 63 as a standard tunnel with concrete lagging of a semicircular profile to enable transport. The tunnel is connected to the inner communication route in the repository leading to the individual storage rooms. The communication route is 6 - 8 m wide and 4 - 5 m high. The individual storage rooms are accessible from the communication route.

The mine work is stable from the geotechnical viewpoint.

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

The mine premises and storage 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) are 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.

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 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.

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:

- the high humidity in the underground premises and substantial flow rate of mine water nearby the storage rooms,
- high concentration of radon decay products (however not generated by the disposed radioactive waste, but natural activity of the host environment), which necessitate a special regime to be maintained.

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.

8.4.3.3 RAW Repository Dukovany

RAW repository Dukovany has been in permanent operation since 1995. It consists of 112 tanks arranged in four rows, each with 28 tanks sized 5.3 x 5.4 x 17.3 m. Four tanks make up 1 dilatation unit, with a free space between the dilatation units filled with heraclite. Each tank is covered with 14 sloping panels of three types. The engineering barriers in RAW repository are represented by the waste form itself (bitumen, pressed radioactive waste), 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 tanks 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 a former limestone mine Alkazar near Beroun was in operation in 1959 - 1964. It was established based on the governmental Resolution No. 231/1979 and related decisions by the ministry of chemical industry.

RAW is deposited 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 collection and disposal of RAW. The RAW was mostly stored in 60 l zinc-plated drums and some contaminated voluminous equipment was freed 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 deposited here "forever". The decision was in agreement with the then effectual regulations and the state took charge of the future safety of the Hostím repository.

The Town Office in Beroun administers the site over RAW repository Hostím. 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 and therefore it is not supervised by the Ministry of the Environment. In 1990 the Hostím RAW 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 conditioning 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 high-level waste storage facility was put into trial operation based on a decision issued by SÚJB in 1995 for a period of one year and into permanent operation in 1997.

The Pre-operational Safety Report for the high-level waste 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.

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; 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 licence 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.

Decree No. 307/2002 Coll., on radiation protection, requires in § 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 acceptance criteria for RAW disposal. Requirements for the content of safety reports are provided in SÚJB recommendations.

The criterion established by the regulatory body in § 52 paragraph 6 Decree No. 307/2002 Coll. is the optimization limit 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 licence, 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

A systematic safety assessment and evaluation of impacts on the environment has 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 bituminisation line. Results of calculations of radiological impacts of the bituminisation 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/y. SÚJB Decree 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/y.

8.5.2 Nuclear Power Plant Temelín

A systematic safety assessment 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 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/y. In the scenario of the waste leakage into the underground water the effective dose will be 0.03 mSv/y. The general limit for an individual from population is 1 mSv/y.

Another potential incident with a substantial impact on the environment is a fire of the bituminisation line. Results of calculations of radiological impacts of the bituminisation 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/y. SÚJB Decree 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/y.

8.5.3 SÚRAO

8.5.3.1 RAW Repository Richard

A revision of safety analyses for RAW repository Richard had been performed by the end of 2002 which was a continuation of safety analyses and their revisions performed in 1995, 1998 and 1999 and used as supporting documents for the application for a licence to operate the repository.

The safety analyses performed in 2000–2002 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 is being updated using data from the newly made drill holes to further specify hydrogeologic data in the location.

Safety analyses evaluated 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 the comparison.

8.5.3.2 Repository Bratrství

A revision of safety analyses for the Bratrství repository had been performed by the end of 2002 which was a continuation of safety analyses performed in 1999 and used as supporting documents for the application for a licence to operate the repository.

The safety analyses performed in 2000–2002 were supposed to verify the repository capacity and to propose the 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 backfilling materials, particularly bentonites and materials on cement basis.

The safety analyses evaluated 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, 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 licence 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 deposited 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 nuclear power plants the safety analyses were extended to include an analysis of potential disposal of other waste types. Subsequently, acceptability 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 evaluated individual personal doses in the following three scenarios: tank effect, 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 acceptability criteria for RAW in the RAW Dukovany repository have been proposed based on the comparison. The acceptability 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 deposited RAW, and radiation and mining survey was performed 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 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 retreatment 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 licence issuance:

- 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 – High-level Waste Storage Facility in ÚJV Řež a. s., ÚJV 1987,
- Pre-operational Safety Report for the High-level Waste 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 licence 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 licence 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 licence to operate RAW repositories and facilities for RAW management in NI from the viewpoint of nuclear safety and radiation protection consists of the Atomic Act and its implementing regulations:

- 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 selected 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 NI are activities subject to the SÚJB licence under § 9, paragraph 1, letters c) and d) of the Atomic Act. A precondition of such licences for commissioning and operation of a NI under § 13, paragraph 5 of the Atomic Act is an approved quality assurance program, method of physical protection assurance for the NI and nuclear materials and on-site emergency plan.

ÚRAO and RAW management facilities in NI 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 selected equipment,
- Other documents which shall contain:
  - schedule of works,
  - program of works,
  - evidence that previous SÚJB decisions 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 licence 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 licence for operation of a NI, while SÚJB shall approve changes in the documents approved in the earlier stages 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 § 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 licencee under § 9 paragraph 1 letter j) of the Atomic Act. The licence 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 licencee under § 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 licence for RAW management under § 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 licence 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 licence to manage RAW. SÚJB shall approve the monitoring program.

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 segregation of RAW are described in the internal regulations inspected by SÚJB. The regulations comply with the requirements of Decree No. 307/2002 Coll. for segregation and characterization of radioactive waste.

The obligation of the licencee holding a licence 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.

SÚJB approves a proposed method of NPP decommissioning as a part of the licence to operate the plant. The document content complies with the requirements of Decree No. 196/1999 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. 196/2002 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 licence for RAW management under § 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 licence 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 licence to manage RAW. SÚJB shall approve the monitoring program.

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 segregating of RAW are described in the internal regulations inspected by SÚJB. The regulations comply with the requirements of Decree No. 307/2002 Coll. for segregating and characterization of radioactive waste.

The obligation of the licencee holding a licence 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.

SÚJB approves a proposed method of NPP decommissioning as a part of the licence to operate the plant. The document content complies with the requirements of Decree No. 196/1999 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. 196/2002 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. Because the disposal of RAW is a special kind of human intervention into the earth crust, during the safety assessment the § 34, paragraph 1 of the Act No. 44/1988 Coll. had to be taken into account.

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.

The volume activity of radionuclides in samples from the deep monitoring system is monitored in sampling points in agreement with the monitoring program. The limits and conditions have not been exceeded. The volume activity of ^{3}H has been monitored in three points in the repository and following maximums were measured in 2001:

in front of room No. 18 3.8×10^3 Bq/m^3,
room No. 420/1 2.2×10^3 Bq/m^3,
10 m after the ventilator 4.5×10^3 Bq/m^3.

The limit volume activity for the repository atmosphere is 3×10^4 Bq/m^3.

The maximum intake of radon for a worker in the course of 2001 was 0.11 MBq, which corresponds to the dose 0.733 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 of in agreement with the acceptance criteria valid in the given period. When disposing the waste the operator checks it for the following:

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

The individual packagings are disposed in disposal chambers.

After its filling each room is closed. The rooms are closed with steel grids to assure perfect ventilation of the rooms and to prevent access of unauthorized persons.

Individual packagings 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 packagings).

Tab. 8.1 Acceptability criteria for disposal

Radionuclide	**Activity disposed in 2001** [Bq]	**Total disposed activity** [Bq]	**Total activity limit** [Bq]
^{3}H	3.2×10^{10}	5.00×10^{13}	1×10^{15}
^{14}C	2.1×10^{10}	7.22×10^{12}	1×10^{14}
^{90}Sr	4.8×10^{10}	3.25×10^{12}	3×10^{14}
^{137}Cs	3.0×10^{10}	4.2×10^{14}	1×10^{15}
Long-lived alpha	1.4×10^{10}	1.4×10^{13}	2×10^{13}

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 radioactive waste, stored in rooms separated from the disposal rooms (this concerns particularly the radionuclides ^{241}Am, ^{238}Pu and ^{239}Pu).

Tab. 8.2 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	5 096 m^3 (volume of deposited RAW 2 071 m^3, filling coefficient 0,41)
Free volume	3 302 m^3 (filling rate about 60 %)
Access tunnel and other communications (including that to Richard I)	8 652 m^3
Activity converted as in 2001	1×10^{15} Bq (95 % of the activity is from spent sealed sources - ^{60}Co, ^{137}Cs, ^{241}Am, ^{239}Pu, ^{90}Sr, ^{85}Kr, ^{147}Pm; 80 - 90 % of unsealed sources is ^{3}H)

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 packaging used for RAW disposal has been a sandwich-packaging unit with the volume of 200 l with anticorrosion finish. The drums are laid down flat in layers up to about 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 RaSO4 in platinum cases (medical sources), Ra-Be neutron sources, laboratory waste containing natural radionuclides, depleted uranium and natural thorium (mostly as $Th(NO_3)_4.5H_2O$ a ThO_2).

The overall inventory of selected radionuclides disposed in the repository shall not exceed 2×10^{12} Bq of natural radionuclides.

By now the following activity of natural radionuclides has been disposed in the Bratrství repository (see Table 8.3):

Tab. 8.3 Activities of the disposed natural radionuclides

Radionuclide	**Activity** [Bq]
^{238}**U**	2.96×10^{11} Bq
^{235}**U**	1.80×10^{10} Bq
^{234}**U**	1.42×10^{10} Bq
^{232}**Th**	1.78×10^{8} Bq
^{210}**Po**	2.00×10^{6} Bq

Tab. 8.4 Summary data on the repository Bratrství

Beginning of operation	1972
End of operation	2030
Repository depth under the surface	over 50 m
Total volume adapted for the repository	3500 m^3 (the anticipated storage layer is 2 m, however it may be more in rooms No. 1, 4 and 5)
Filled volume	1320 m^3 (volume of deposited RAW 240 m^3, filling coefficient 0,5)
Free volume	485 m^3 (filling rate about 50 %)
Total ^{226}Ra in the repository	25 g
Activity converted as in 2001	1.2×10^{12} Bq

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,
- passability 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 radioactive waste, including the activity. The exclusive type of packaging 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. 8.5 Radioactive waste disposed in the repository by now

Radionuclide	Activity deposited [Bq]	Activity limit in RAW repository [Bq]
^{14}C	$1.37x10^{10}$	$1x10^{12}$
^{41}Ca	$9.28x10^{7}$	$3x10^{11}$
^{59}Ni	$1.11x10^{9}$	$3x10^{12}$
^{63}Ni	$2.57x10^{10}$	$3x10^{13}$
^{90}Sr	$2.44x10^{9}$	$1x10^{13}$
^{94}Nb	$9.123x10^{8}$	$3x10^{10}$
^{99}Tc	$1.18x10^{9}$	$1x10^{12}$
^{129}I	$3.64x10^{8}$	$1x10^{11}$
^{137}Cs	$3.62x10^{11}$	$3x10^{14}$
^{239}Pu	$2.61x10^{6}$	$6x10^{9}$
^{241}Am	$5.14x10^{6}$	$3x10^{9}$

Tab. 8.7 Summary data on RAW repository Dukovany

Beginning of operation	1995
End of operation	2100
Repository depth under the surface	0
Total volume adapted for the repository	55 000 m^3
Filled volume	3 500 m^3
Free volume	51 500 m^3 (filling rate about 7 %)
Activity converted as in 2002	$1x10^{12}$ Bq (without correction for the transformation)

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 deposited 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 RAW 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 retreatment 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. 8.8 Summary data on RAW repository Hostím

Beginning of operation	1959	
End of operation	1964	
Final sealing	1997	
Repository depth under the surface	About 30 m	
	Gallery A	**Gallery B**
Repository volume	about 360 m^3	1220 m^3
Total volume of deposited RAW	about 1/3 of the gallery	200 m^3
Activity converted as in 1997	Estimate: equivalent of the gallery A, up to 1×10^{10} Bq (the range of radionuclides produced in the then ÚJF)	about 10^{11} Bq (mostly ^{137}Cs, ^{90}Sr, ^{3}H, ^{14}C)

8.6.4 ÚJV Řež a. s.

8.6.4.1 Building 241 – RAW Management Facility Velké zbytky

SÚJB has issued the following licences concerning operation of the facility in the Building 241 (RAW Management Facility Velké zbytky):

- Licence for operation of a workplace with significant sources of ionizing radiation, licence for handling of sources of ionizing radiation from 1999,
- Licence for RAW management, which covers collection, segregation, treatment, conditioning and storage of RAW, the licence 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),
- Assurance of 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).

SÚJB has approved the limits and condition for radioactive management.

8.6.4.2 Building 211/8 – HLW Storage Facility

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

- licence for operation of a workplace with very significant sources of ionizing radiation, i.e. a workplace with high-level waste storage facility – Building 211/8,

- licence for operation of a NI – a workplace with HLW storage facility in ÚJV Řež a. s.

A decision issued by SÚJB has approved limits and condition for operation of high-level waste storage facility (Building 211/8).

Management of RAW and ionizing radiation 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, particularly design organizations.

The system for RAW management includes a segregation process, which has a decisive effect on the efficiency of RAW treatment. The segregating process features the following key parameters:

- type of material and dimensions,
- nature of contamination:
  - level of contamination,
  - nature (type) of contaminants,
  - nature of contaminants fixation on the surface.

The parameters for segregating of RAW into groups (classes) then determine further treatment and selection of methods to treat the waste.

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

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

The criteria for RAW segregation into groups are derived from a method for treatment and conditioning of the waste and from the acceptance criteria for storage and disposal.

RAW is segregated 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 segregating may be performed, based on treatment requirements and disposal conditions, e.g. :

- organic solvents, oils, oil products,
- spent 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, Segregating 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, Segregating 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 licences.

Regulations about keeping and maintenance of the data are specified in the following Quality Assurance Program:

- Quality assurance program for RAW management, Segregating Number 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, Segregating Number No. 4.2.8/406, Edition No. 1, Revision No. 1. valid since 4 September 2000.

Decommissioning Programs

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

- Proposed way of decommissioning method for the HLW storage facility (HLW storage facility - Building 211/8),
- Proposed waz of decommissioning method for workplaces with significant ionizing radiation sources in Building 241 (RAW Management Facility Velké zbytky).

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 § 18 paragraph 1) the following obligations, among others:

A licencee 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 § 25 of the Atomic Act safe disposal of all radioactive wastes, including monitoring and inspections of repositories even after their closure. Responsibility for the monitoring of repositories is defined in § 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 way of decommissioning method approved by SÚJB. It is anticipated that disposal rooms 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 Repository Bratrství

A method to close the repository is provided in the proposal of a way of 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 way of 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

3. 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; 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;

(iv) *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.*

4. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees South for storage or disposal.

5. 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 treatment to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin; the right of a Contracting Party to export its spent fuel for retreatment;

(iii) rights of a Contracting Party to which spent fuel is exported for retreatment to return, or provide for the return of, radioactive waste and other products resulting from retreatment 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 § 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 treatment or retreatment having been approved by the Office, is prohibited."

International transport of RAW (i.e. only its transit or export) is subject to a licence by SÚJB under § 9 paragraph 1 letters m) and p) of the Atomic Act and the method of transport is governed by provisions of § 8 through § 10 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).

Provisions of § 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 road
- Council Directive 96/49/EC of 23 July 1996 on the approximation of the laws of the Member States with regard to the transport of dangerous goods by rail.

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

- Council Directive 92/3/Euratom of 3 February 1992 on the supervision 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.

However, the provisions in § 10 of Decree No. 317/2002 Coll. will come into effect only on the date the Czech Republic joins EU.

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 covering the 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 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 the split of Czechoslovakia into the Czech Republic and 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.

The precondition for import of the SF was to build SF interim storage in NPP Dukovany. The interim storage was completed in 1995, based on an approval process which involved approval of siting, construction, trial operation and operation. The trial operation in the storage started on 5 December 1995. Late in 1996 the approval process was completed and early in 1997 SÚJB issued an approval for commercial operation of ISFSF Dukovany in NPP Dukovany valid until 31 December 2007.

International transports of SF from Slovakia to the Czech Republic were performed by rail, based on a series of SÚJB decisions 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.

Initially, SÚJB issued an approval to use transport packaging – casks C-30 type B(M) with the original identification marking DDR/20/B(M)F for transport of SF - fuel assembly VVER 440 using the "wet method“ under special conditions and a permit for international transport of SF by railway.

However, in the course of 1995 the approval process was completed for the cask CASTOR-440/84 type B(U) made in Germany, for transport and storage of SF of VVER 440 type. The SÚJB approval to use CASTOR-440/84 cask was issued on 27 October 1995 and it was identified as CZ/004/B(U)F – 85. The competent body in the Federal Republic of Germany also licenced the cask and identified it as D/4311/B(U)F – 85 by the certificate of 26 June 1995. SÚJB issued the approval for railway transport of SF in CASTOR-440/84 casks on 31 January 1997.

The approval to use the design of the transport and storage cask 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. SÚJB issued a special permit for this transport on 16 February 1996.

In 1995 – 1997 fourteen reimport transports took place of SF used in EDU, from the ISFSF SE a. s. at NPP Jaslovské Bohunice back to ISFSF Dukovany. For the first eight transports, from the middle of 1995 to the middle of 1996, casks C-30 type B(M) were used, for the remaining six transports casks CASTOR - 440/84 type B(U) were used.

Throughout the mentioned period SÚJB paid maximum attention to these international transports of SF and SÚJB inspectors performed a number of inspections. It has been concluded from the resulting findings that all organizations involved in the transports fulfilled their obligations. 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, 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.*

§ 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 § 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 § 90 paragraphs 2, 3 and 4 requires also the following documents and data about the ionizing radiation sources:

- date of physical takeover of ionizing radiation sources,
- document about acquisition of the ionizing radiation source,
- for an ionizing radiation source subject to type-approval, except radionuclide sources, declaration of compliance issued by the manufacturer, importer or distributor,
- certificate for a sealed radionuclide source,
- accompanying sheet for an unsealed radionuclide source, issued at the handover of the source by its previous possessor,
- report about the handover test, reports on tests of long-term stability and reports on tests of operational stability,
- provided a source of ionizing radiation is handed over into possession of another person, data about to whom and when the source was handed over and for unsealed radionuclide sources also an accompanying sheet issued at the handover,
- provided a radionuclide source is to be introduced into the environment, records about its introduction into the environment,
- provided a radionuclide source is to be disposed as radioactive waste, data about to whom and when the source was handed over and an accompanying sheet for RAW issued at the handover.

The data under paragraphs 1 and 2 shall be retained for at least 10 years after the ionizing radiation source handling is completed.

Licencees which 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 licence 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 criteria for the disposal.

The premises of the Richard repository include a pipe-safe. It was established here in the early 1970s. The safe consists of 15 thick-wall stainless steel pipes about 3 m long, vertically embedded into the subbase; the pipes are provided with lead plugs. The safe is provided with transportation and other operating technology. The safe includes used Co and Cs sealed sources. The system tightness is monitored.

The Czech legislation enables reimports of a sealed source by its manufacturer as specified in § 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 treatment or retreatment having been approved by the Office, is prohibited."*

11. Planned Activities to Improve Safety

11.1 Nuclear Power Plant Dukovany

In connection with SF management NPP Dukovany has a developed symptom-oriented procedure to deal with extraordinary conditions of SF pool in the reactor units. The procedure has been developed in cooperation with Westinghouse and will be issued soon. The document is based on international recommendations for this field.

The radiation monitoring system at NPP Dukovany will be extended to include the so-called monitoring of airflow from the drying system of SF casks. The system will perform inspection of hermetic tightness of FA in the course of cask drying and at the same time it will check the released airflow for activity.

Conditioning of radioactive sludges and ion exchangers is being addressed but not yet performed. EDU has not approved or introduced any conditioning because they are not satisfied with its current technical standard. The capacity of storage tanks for spent ion exchangers is sufficient for the planned service life of the plant. EDU is successfully implementing a program to reduce production of this RAW (the annual volume of spent ion exchangers has been reduced by up to 80 %). At the moment EDU has sufficient storage premises and at the same time reduced the produced amount of waste and therefore the introduction of conditioning of this RAW is in no way urgent. EDU is continually monitoring and analyzing other potential solution of RAW conditioning, in order to reduce financial costs of technological processes, to reduce the final volume of conditioned RAW and improve parameters of the product, considering the acceptance criteria of the repository.

11.2 Nuclear Power Plant Temelín

As NPP Temelín was not by 31 December 2002 in commercial operation all activities aimed at safety improvement have been continually incorporated into the operating procedures in the course of the NI commissioning.

11.3 ÚJV Řež a. s.

The following investigations were performed in 1996 – 1997:

- corrosion on the fuel IRT–2M, with enrichment 80 % wt. ^{235}U, whic was used in ŠR-0 reactor in Plzeň,
- corrosion on the fuel IRT–2M with enrichment 36 % wt. ^{235}U used in the training reactor VR-1 in FJFI,
- corrosion on the fuel stored in the SF storage facility .

Meanwhile, SÚJB significantly increased its requirements for demonstration of tightness of FA before transport into HLW storage facility. The requirement of SÚJB was specified in item 6 in the Decision No. 334/96, requiring 100 % inspection of tightness of FA before transport into the HLW storage facility. SÚJB also requested that before the transport a calculation should be submitted to document released heat for each FA (Protocol on inspection by SÚJB No. 5/97-ÚJV, corrective measures).

For this reason activities were performed to identify tightness of the stored FA. The activities included particularly:

- development of methods for inspection of fuel assembly tightness,
- production of fixtures for tightness inspection,
- modifications of and amendments to spectrometric evaluation of activity of flushing water during tightness inspection of fuel assemblies,
- adaptation of programs for calculation of released heat.

SF identified as non-hermetic was closed into hermetic cask, while the developed design of cask, including a program of inspections in the course of their manufacture, were consulted with SÚJB and adapted in agreement with SÚJB requirements.

An analysis of residual heat removal from FA closed in casks was performed in agreement with SÚJB requirement and handed over to SÚJB.

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 past practices and have been gradually liquidated (see chapter 8.2.4). These facilities contain RAW from operation and from refurbishment of the NI or workplaces with ionizing radiation sources accumulated earlier. Following facilities are gradually liquidated:

- Building 211/6 – Reloading place of RAW,
- Building 241 – RAW management facility Velké zbytky, containing technology for treatment and conditioning of RAW,
- Storage area for RAW Červená skála,
- Building 211/5 – Decay tanks for RAW.

11.4 SÚRAO

11.4.1 RAW Repository Richard

Decision about further activities will be made after completion of safety analyses. It is expected that backfilling materials will be used and specification of the inventory categorization into radioactive materials stored and deposited.

11.4.2 Repository Bratrství

A decision about further activities will be made after the licence to operate the repository is renewed, based on completed safety analyses. It is expected that backfilling materials will be applied.

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 top 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 of FA]	**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 Dukovany	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	284	
	SF dry storage in HLW storage facility	192	
	SF pool at reactor hall	60	
	SF storage facility	80	

12.2 List of RAW Management Facilities

Tab. 12.2 List of RAW Management Facilities

Licencee for RAW management	Facility	Storage/disposal capacity
EDU	**Storage and Conditioning of Liquid RAW**	
	RAW Concentrate Tanks	5000 m^3
	Storage Tank for Active Sorbents	460 m^3
	Collection, Storage and Treatment of Solid RAW	
	Segregating workplace and storage of solid RAW	1100 t
ETE	**Storage and Conditioning of Liquid RAW (BAPP)**	
	Storage for Active Sorbents	200 m^3
	RAW Concentrate Tanks	500 m^3
	Collection, storage and conditioning of solid RAW (BAPP)	
	Storage of Solid RAW	850 m^3
SÚRAO	**RAW Repository Richard**	17 050 m^3
	Repository Bratrství	3 500 m^3
	RAW Repository Dukovany	55 000 m^3
	RAW Repository Hostím	1 580 m^3
ÚJV Řež a. s.	**RAW Management Facility Velké zbytky**	
	Storage of Liquid RAW	146 m^3
	Storage of Solid RAW	1080 m^3
	Storage of HLW	300 m^3
	Storage Area Červena skála	198 m^3

12.3 List of Nuclear Installations in the Decommissioning Stage

At the development time of this National Report (January 2003) there are no NI 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 Plzeň –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 2002)

Location	Facility Name	Number of FA stored [pieces]	Weight of stored FA [tons of HM]
Dukovany	SF pool - reactor unit 1	578	69
	SF pool - reactor unit 2	619	74
	SF pool - reactor unit 3	628	75
	SF pool - reactor unit 4	463	55
	CASTOR-440/84 cask at the service area in the reactor hall, reactor unit 3	84	10
	ISFSF Dukovany	3 864	461
Temelín	SF pool - reactor unit 1	0	0
	SF pool - reactor unit 2	0	0
Řež	SF pool in HLW storage facility	228 + 16**	0.0566
	SF dry storage in HLW storage facility	190***	0.265
	SF pool at reactor hall	19 + 2*	
	SF storage facility	37 + 22*	

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 2002)

Licencee for RAW management	Facility	Filled up storage/disposal area
EDU	Storage of liquid RAW	2819 m^3
	Collection, Storage and Treatment of Solid RAW	921 t
ETE	Storage and Conditioning of Liquid RAW (BAPP)	226 m^3
	Collection, Storage and Conditioning of Solid RAW (BAPP)	22 t
SÚRAO	RAW Repository Richard	6 025 m^3
	Repository Bratrství	1 320 m^3
	RAW Repository Dukovany	3 750 m^3
	RAW Repository Hostím	330 m^3
ÚJV Řež a. s.	RAW Management Facility Velké zbytky	597 m^3
	Storage Area Červena skála	198 m^3
	HLW Storage Facility	6.8 m^3

Fore more details see 4.2.

12.6 Overview of 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 § 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 § 23 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 (revoking Decrees No. 142/1997 Coll. and No. 143/1997 Coll.),
- 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 issuance 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 (revoking Decree No. 147/1999 Coll.).
- 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 (revoking Decree No. 219/1997 Coll.).
- Decree No. **106/1998 Coll.**, on nuclear safety assurance of nuclear installations during their commissioning and operation,
- Decree No. **195/1999 Coll.**, on requirements for nuclear installations to assure nuclear safety, radiation protection and emergency preparedness,
- Decree No. **196/1999 Coll.**, on decommissioning of nuclear installations or workplaces with significant or very significant sources of ionizing radiation
- 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 passports.

12.6.1.1.3 Other Regulations

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

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 the protection and utilization of mineral resources (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. **21/1997 Coll.**, on inspection of export and import of goods and technologies subject to international inspection regimes, as amended later (§ 20).
- 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 § 14 thereof).
- Act No. **123/2000 Coll.**, on medical means and alterations in some related acts.(§ 7, § 23, § 24, § 28, § 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 (§ 6 letter b)).
- Act No. **219/2000 Coll.**, property of the Czech Republic and its treatment in legal regulations, 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 licencee (Decree on basic services provided by postal services licencees) - § 3.

- Act No. **244/2000 Coll.**, amending Act No. 91/1996 Coll., on animal food (§ 3 paragraph 13).
- Decree No. **350/2000 Coll.**, regulating sale of medical means (§ 1 paragraph 2 letter e, § 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 (§ 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 (§ 4 paragraph 3 and Appendix No. 1 item 6).
- Act No. **100/2001 Coll.**, on environmental impact assessment 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 – § 3.
- Government Order No. **181/2001 Coll.,** establishing technical requirements for medical means, as amended later (Government Order No. 336/2001 Coll.).

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 No. **380/2002 Coll.,** issued by the Ministry of the Interior 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

Jánský V. (2002): Quality Assurance Program for the Activity Licenced under Act No. 18/1997 Coll., § 9, paragraph 1, letters d), e), i) and l), ČEZ, a. s., Nuclear Power Plant Dukovany

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

Ondrák C., Kresan P.(2001): Limits and Conditions for Safe Operation, A004a, ČEZ, a. s., Nuclear Power Plant Dukovany

Ondrák C., Kresan P.(2001): Substantiation of Limits and Conditions for Safe Operation, A004b, ČEZ, a. s., Nuclear Power Plant Dukovany

12.7.2 ISFSF Dukovany

Babičová E. (1992): NPP Dukovany ISFSF. Final Report on Additional Geology Engineering Survey in the Area of Anticipated Interim Storage of Spent Fuel at NPP Dukovany, GEOtest Brno

Team of Authors (1993): Preliminary Safety Report for the ISFSF Building, Dukovany, EGPI s. r. o., Uherský Brod

Team of Authors (1995): ISFSF Dukovany, Pre-operational Safety Report, Revision 1, EGPI s. r. o., Uherský Brod

Team of Authors (1997): Conversion of Thermal Output Removal for CASTOR–440/84 Cask by Natural Cooling from ISFSF Building, EGPI s. r. o., Uherský Brod

Krula P., Kuba S., Keselica M.(2001): Limits and Conditions for ISFSF, A066j, ČEZ, a. s., Nuclear Power Plant Dukovany

Krula P., Kuba S., Keselica M.(2001): Limits and Conditions for ISFSF – substantiation, A066j, ČEZ, a. s., Nuclear Power Plant Dukovany

Rech S. (1994): NPP Dukovany – Spent Fuel Interim Storage, compaction inspection. Final Report on Suitability of Backfilling Materials and Compaction Tests of the Compacted Bed for Spent Fuel Interim Storage at NPP Dukovany, GEOtest Brno, a. s.

Stehlíková V. (1991): NPP Dukovany – Spent Fuel Interim Storage. Final Report on Detailed Engineering Geological Survey of Foundation Terms at the Spent Fuel Interim Storage Site in NPP Dukovany, GEOtest Brno, s. p.

Stehlíková V. (1994): NPP Dukovany – Spent Fuel Interim Storage. Final Report on Engineering Geology Documents for Foot Level of Foundation at Spent Fuel Interim Storage in NPP Dukovany, okr. Třebíč, GEOtest Brno, a. s.

Tuscher V. (1992): NPP Dukovany – Spent Fuel Interim Storage. Final Report (stage 2 – part 1). Detailed Hydrogeological Survey. GEOtest Brno, a. s.

Tuscher V. (1993): NPP Dukovany – Spent Fuel Interim Storage. Partial Report (stage 2 – part 2). Detailed Hydrogeological Survey. GEOtest Brno, a. s.

Tuscher V. (1994): NPP Dukovany – Spent Fuel Interim Storage. 2nd Partial Report (stage 2 – part 2). Detailed Hydrogeological Survey. GEOtest Brno, a. s.

Tuscher V. (1995): NPP Dukovany – Spent Fuel Interim Storage. 3rd Partial Report (stage 2 – part 2). Detailed Hydrogeological Survey. GEOtest Brno, a. s.

12.7.3 SFSF Dukovany

Coufal J. (2002) Quality Assurance Program ČEZ, a. s., Spent fuel storage facility Construction in ČEZ, a. s. Location , NPP Dukovany, ref. No. 03/2002, ČEZ, a. s., Hlavní správa, Praha

Team of Authors (1998): Documents on Assessment of the Project Impact on the Environment Spent Fuel Interim Storage in the NPP Dukovany Site, INVESTprojekt s. r. o.

Team of Authors (1999): Spent Fuel Storage, Specification Safety Report, Revision 2, Energoprojekt Praha a. s.

Team of Authors (2002): Proposed Method of Physical Protection Assurance for the Spent Fuel Storage Facility Nuclear Installation in the NPP Dukovany Site, EBIS spol. s r. o.

Team of Authors (2002): List of Selected Equipment, Revision 1, under I.8 in Appendix to Act No. 18/1997 Coll. as amended later, Energoprojekt Praha a. s.

Team of Authors (2002): Spent fuel storage facility, Preliminary Safety Report, Revision 1, Energoprojekt Praha a. s.

Team of Authors (2002): Beyond Design Basis Accidents in Spent fuel storage facility EDU and Analysis of their Radiological Consequences, Technical Report, Energoprojekt Praha a. s.

12.7.4 RAW Repository Dukovany

Dlouhý Z., Nachmilner L., Vaněček M., Konopásková S. (1989): Regional Repository of Radioactive Wastes Dukovany – Pre-operational Safety Report, ÚJV Řež a. s.

Dohnálek J. et all. (1995): Study of General Corrosion Mechanisms and Forecast of Service Life for Reinforced Concrete Structures of RAW repository in the NPP Dukovany Site, J. Dohnálek

Dohnálek J. et all. (1995): Survey of the Current Condition of Reinforced Concrete Structures of RAW Repository in the NPP Dukovany Site and Calculation of the Probable Service Life, J. Dohnálek

Dohnálek J. et all.(1995): Proposal of Additional Measures to Reduce Corrosion Rate in Reinforced Concrete Structures of RAW repository Dukovany, J. Dohnálek

Dohnálek J. et all. (1995): Program of Long-term Monitoring of Factors Affecting Service Life of Reinforced Concrete Structured of RAW repository Dukovany and Experimental Setup to Monitor Corrosion of Reinforcement, J. Dohnálek

Doležal (1999): Inputs for the Variant Study of Radioactive Waste Management and Spent Fuel Management in ČR (ÚJV) – WADE a. s.

Hercík M. (1995): Final Report on Hydrogeology Survey in Dukovany, R. Hankus, Slaný

Team of Authors (1982): Design Documents, Accompanying Report of the Regional Storage of RAW–ČSR, Chemoprojekt, Praha

Team of Authors (1999): Variant Study of Radioactive Waste Management and Spent Fuel Management in ČR, ÚJV Řež a. s.

Konopásková S., Lietava P., Nachmilner L., Vokál A.(1995): Interim Safety Report RAW repository Dukovany, ÚJV Řež a. s.

Konopásková S. (1999): Limits and Conditions for Safe Operation for RAW repository Dukovany, Terms of Acceptance, SÚRAO Praha

Kulovaný J. (1999): Radioactive Wastes in NPP Dukovany – Nuclear Energy Safety, 5/6

Lietava, P. et all.(2000) Safety Analysis of RAW repository Dukovany, ÚJV Řež a. s.

Marek P., Lietava P., Konopásková S., Hlaváček I., Hlaváčková I. (1992): Field Trace Test of RAW repository Dukovany Site , ÚJV Řež a. s.

Marek P., Jedináková V. (1993): Effect of Presence of Selected Radionuclides on the Radioactive Waste Acceptance Criteria for Surface Repository, ÚJV 100036 CH, ÚJV Řež a. s.

Mátl V. et all. (1990): Final Report on Hydrogeology Survey for Construction of Regional RAW Repository, Geotest Brno

Mátl V. et all. (1995): Dukovany–JE–HG, GEOtest Brno

Milický M., Čurda S., Šanda M. (2000): Dukovany – RAW repository. Model of Underground Water Flow and Transport of Radionuclides in Underground Water, ProGeo

Nachmilner L., Konopásková S., Lietava P., Vaněček M., Kouřím V. (1991): Safety Analysis of RAW Repository at Dukovany Site, ÚJV Řež a. s.

Starostová V.(1999): Proposed Method of Decommissioning for the Radioactive Waste Repository in Dukovany, SÚRAO Praha

Sázavský et all.(1998): Analysis of RA Sorbents and Sludge in Tanks OTW30B2 and OTW30B1 at NPP Dukovany, ÚJV Řež a. s.

Team of Authors (2000): Registration Sheet of Radioactive Waste Generator – ČEZ, a. s., SÚRAO Praha.

12.7.5 Nuclear Power Plant Temelín

Hončarenko R. (2001): Limits and Conditions, 2 TL 001, Revision 0, ČEZ, a. s., Nuclear Power Plant Temelín

Hončarenko R. (2002): Limits and Conditions – Substantiation, 2 TL 002, Revision 0, ČEZ, a. s., Nuclear Power Plant Temelín

Hončarenko R. (2002): Limits and Conditions, 1 TL 001, Revision 1, ČEZ, a. s., Nuclear Power Plant Temelín

Hončarenko R. (2002): Limits and Conditions – Substantiation, 1 TL 002, Revision 1, ČEZ, a. s., Nuclear Power Plant Temelín

Team of Authors (1992): Strength and Seismic Calculation of a Compact Grid for Spent Fuel Ae 7652/Dok, ŠKODA JS a. s., Plzeň

Team of Authors (1992): Strength Calculation of the Hermetic Case for Damaged Fuel Assemblies, Ae 7653/Dok, ŠKODA JS a. s., Plzeň

Team of Authors (1996): Strength and Seismic Calculation of a Compact Grid for Spent Fuel, Ae 4083/Dok C, ŠKODA JS a. s., Plzeň

Team of Authors (1998): Technical Report – Calculation of Spent fuel pool Cooling ČEZ, a. s, – ETE, 4–years campaign, Ae 8521/Dok, ŠKODA JS a. s., Plzeň

Team of Authors (1999): Nuclear Power Plant Temelín, Unit 1, Pre-operational Safety Report, Revision 1, Škoda Praha a. s.

Team of Authors (2001): Nuclear Power Plant Temelín, Unit 2, Pre-operational Safety Report, Revision 0, Energoprojekt Praha a. s.

Team of Authors (2001): Nuclear Power Plant Temelín, Unit 1, List of Selected Equipment under Decree No. 214/1997 Coll., Revision 1, Energoprojekt Praha a. s.

Team of Authors (2001): Nuclear Power Plant Temelín, Unit 2, List of Selected Equipment under Decree No. 214/1997 Coll., Revision 1, Energoprojekt Praha a. s.

Matoušek P. (2000): Quality Assurance Program under § 32 of Decree SÚJB No. 214/1997 Coll. for the activity licenced under Act No. 18/1997 Coll., § 9, paragraph 1, Active Testing of Units 1 and 2 NPP Temelín, Nuclear Power Plant Temelín.

12.7.6 Reactor LVR–15

Ernest J. (1995): Criticality Computation for Storage Casks for IRT – 2M Spent Fuel at the LVR – 15 Reactor Workplace and High-level Waste Storage Facility, ÚJV Report 10403, ÚJV Řež a. s.

Flíbor S. (2002): MCNP Fresh Fuel Storage Computation , ÚJV Report 11782, ÚJV Řež a. s.

Team of Authors (2002): Operational Safety Report of the Reactor LVR–15, Part 1 - 3, ÚJV 11751, ÚJV Řež a. s.

Team of Authors (2002): Limits and Conditions for Permanent Operation of the Reactor LVR–15, Edition No. 3, Revision 0, ÚJV 11755T, ÚJV Řež a. s.

Program for Transport, Storage and Handling of Fuel for the Reactor LVR – 15, Revision 3, Ref. No. DRS 1054, ÚJV Řež a. s.

12.7.7 HLW storage facility

Team of Authors (1999): Proposed Method of High-level Waste Storage Facility Decommissioning (High-level waste storage facility –Building 211/8), ÚJV Řež a. s.

Team of Authors (1999): Proposed Method of Physical Protection Assurance for Nuclear Materials and Nuclear Installations in Nuclear Research Institute Řež a. s., Ref. No. T2/650/1999

Team of Authors (2000): Quality Assurance Program, Operation of High-level Waste Storage Facility, Edition No. 1, Revision 1, ÚJV Řež a. s.

Team of Authors (2001): On-site Emergency Plan for the High-level Waste Storage Facility – Building 211/8, Edition No. 1, Revision 0, ÚJV Řež a. s.

Team of Authors (2001): Pre-operational Safety Report for the High-level Waste Storage Facility - Building 211/8, Amendment to Edition No. 1, Revision 0, ÚJV Řež a. s.

Team of Authors (2002): Estimated Increase in the Exposure of Workers from Spent fuel storage facility on the Second Floor of the High-level Waste Storage Facility, ÚJV Řež a. s.

Team of Authors (2002): Determination of Thermal Output of Spent Fuel Stored in the High-level Waste Storage Facility, ÚJV Řež a. s.

Team of Authors (2002): Limits and Conditions for the High-level Waste Storage Facility Operation (Building 211/8), Edition No. 2, Revision 2, ÚJV Řež a. s.

12.7.8 RAW Repository Richard

Čurda S. a Milický M. (1996): Comparative Computation of Transport for RAW Repository Dukovany, ProGeo, Roztoky

Herčík et all. (1987): Hydrogeology Synthesis of the Czech Cretaceous Basin. Balance Unit 1, Stavební geologie Praha

Janů M. et all. (1996): Safety and Maintenance Assurance in the Richard Repository, Final Report on Performance of HS DE/1/96

Janů M. et all. (1997): Safety Assurance in the Richard Repository, Final Report ARAO a. s. for 1997, ARAO a.s, Praha

Janů M. et all. (1998): Safety Assurance in the Richard Repository, Final Report ARAO a. s. for 1998, ARAO a.s, Praha

Janů M. et all. (1999): Safety Assurance in the Richard Repository, Final Report ARAO a. s. for 1999, ARAO a.s, Praha

Krásný J. et all. (1982): Underground Water Outflow on the Territory of Czechoslovakia– HMÚ Praha

Laštovka J., Nachmilner L., Vaněček M., (1990): Richard II – Safety Analysis, ÚJV Řež a. s.

Lietava P. et all. (1999), Evaluation of Formal, Technical and Safety Risks in the Operation of RAW Repository Richard, ÚJV Řež a. s.

NYCOM (1994) Conditions for Takeover of Radioactive Wastes for Transport and Disposal in the Central Repository NYCOM a. s., Praha

Vrbata L., (1992): Documentary Report on Geological Works in the Repositories of Radioactive Waste Richard and Bratrství Performed in 1992, GEOTIP Praha

Vrbata L., (1993): Documentary Report on Geological Works in the Repositories of Radioactive Waste Richard and Bratrství Performed in 1993, GEOTIP Praha

12.7.9 Repository Bratrství

Blažek J. (1991): Expert Report – Radioactive Waste Repository in the Bratrství Tunnel in Jáchymov from the Viewpoint of Geology and Tectonics

Činka (1998): Report on Geotechnical Monitoring in the Repository of Radioactive Waste– Jáchymov, ILF Consulting Engineers, s.r.o. Praha

Janů M. (1997): Technical Conditions for the Disposal Process of Institutional Radioactive Wastes in the Bratrství Repository, ARAO a. s., Praha

Janů M. (1998): Operating Rules of the Radioactive Waste Repository , ARAO a. s., Praha

Team of Authors (1991): Safety Study of the Low-level Waste Repository Bratrství in Jáchymov, ÚVVVR Praha

Team of Authors (1993): Quality Assurance and Maintenance in the Bratrství Repository, ÚVVVR a. s., Praha

Team of Authors (1995): Quality Assurance and Maintenance in the Bratrství Repository, Nycom a. s., Praha

Team of Authors (1996): Jáchymov – Report on Geotechnical Monitoring in the Repository of Radioactive Waste for 1996, Stavební geologie GEOTECHNIKA a. s., Praha

Team of Authors (1996): Quality Assurance and Maintenance in the Bratrství Repository, Nycom a. s., Praha

Team of Authors (1998): Quality Assurance and Maintenance in the Bratrství Repository, ARAO a. s., Praha

Team of Authors (1999): Study on Evaluation of Formal, Technical and Safety Risks in Operation of the Bratrství Repository of Radioactive Waste and Proposal of Activities Necessary for its Further Operation, IPRON a. s., Praha

Maršál J. (1998): Emergency Plan for the Bratrství Repository of Radioactive Waste, ARAO a. s., Praha

Maršál J. (1998): Monitoring Program for the Bratrství Repository of Radioactive Waste, ARAO a. s., Praha

Vrbata L. (1995): Report on Results of Geology Survey Works in the Radioactive Waste Repositories Richard in Litoměřice and Bratrství in Jáchymov for 1995, GEOTIP s.r.o. Praha

Vrbata L. (1996): Report on Results of Geology Survey Works in the Radioactive Waste Repository Bratrství, Location Jáchymov, and GEOTIP spol. s r. o., Praha

Vrbata L. (1998): Report on Results of Geology Survey Works in the Radioactive Waste Repository Bratrství, Location Jáchymov, GEOTIP spol. s r. o., Praha

12.7.10 RAW Repository Hostím

Hoch K. (1992): Decomposition of Neosalvarsan (Spironovan), Líbeznice

Janů et all. (1991): Evaluation of Safety of the Hostím Repository, Interim Report under contract HS 09/91/ÚVVVR for stages 04, 05 and 07, ÚVVVR a. s., Praha

Janů et all. (1991): Evaluation of Safety of the Hostím Repository, Final Report under contract HS 09/91/ÚVVVR, ÚVVVR a. s., Praha

Janů M. et all. (1992): Safety of the Low-level Waste Repository Hostím, Report on performance under contract HS 12/1992, ÚVVVR a. s., Praha

Janů M. et all. (1993): Conditions for the Final Design of the Radioactive Waste Repository Hostím, Report on performance under contract HS MP1/93/2OO, DE6/93/200, DE7/93/200, ÚVVVR a. s., Praha

Janů M. et all. (1994): Assurance of Quality and Maintenance in the Repository Hostím, Final Report on Performance under contract HS No. DE/4/94 for 1994, Praha

Janů M. et all. (1995): Assurance of Quality and Maintenance in the Repository Hostím, Final Report by NYCOM a. s. on the performance under contract HS No. DE/4/95, NYCOM a. s., Praha

Janů M. et all. (1996): Assurance of Quality and Maintenance in the Repository Hostím, Final Report on performance under contract HS DE/1/96, ARAO a. s., Praha

Janů M. et all. (1997): Safety Assurance in the Repository Hostím, Final Report ARAO a. s. for 1997, ARAO a. s., Praha

Janů M. et all. (1998): Safety Assurance in the Repository Hostím, Final Report ARAO a. s. for 1998, ARAO a. s., Praha

Janů M. et all. (1999): Safety Assurance in the Repository Hostím, Final Report ARAO a. s. for 1999, ARAO a. s., Praha

Team of Authors (1959): Detailed Design of the Repository Hostím, Chemoprojekt Praha

Team of Authors (1992): Geotechnical Assessment of the ALKAZAR Tunnel Stability, Stavební geologie, Geotechnika a. s., Praha

Team of Authors (1992): Geodetic Works and Tectonics Measurements II., mine ALKAZAR, GGS, Beroun, Hořovice

Team of Authors (1996): Final Design of the Radioactive Waste Repository Hostím, Sangreen s.r.o., Praha

Kouřím V., Dlouhý Z. (1992): Use of Inorganic Sorbents as Backfills for Underground Repositories, IAEA–TECDOC–675, IAEA Vienna

Malášek E. (1991): Information on Radioactive Waste Repository Hostím near Beroun, ČSKAE Praha

Maršal et all. (1991): Evaluation of Safety in the Repository Hostím, Partial report on performance under contract HS 09/91 ÚVVVR for February 1991, ÚVVVR a. s., Praha

Nachmilner L.: Repository ALKAZAR – Safety Considerations, ÚJV Řež a. s.

12.8 Overview of Final Reports by International Assessment Missions

12.8.1 Nuclear Power Plant Dukovany

Mission OSART –Technical Notes of the Operational Safety Review Team to Czechoslovakia, NPP Dukovany; IAEA 1989

Re–OSART mission – OSART Mission Recommendations for Maintenance Fulfillment Report, IAEA. 1991

Mission ASSET – ASSET Mission to the Dukovany NPP in Czech Republic, IAEA 1993

WANO mission – WANO "Peer Review" mission 1997

OSART Mission to NPP Dukovany, IAEA 2001

12.8.2 Nuclear Power Plant Temelín

Site Safety Review Mission, IAEA, 1990

Pre-operational Safety of Nuclear Installations, Czech Power Works, Temelín NPP–Report to the Government of the Czech and Slovak Federal Republic, IAEA 1990

Temelín Design Review Mission, IAEA 1990

Technical Notes of the Pre-operational Safety Review Team to Czechoslovakia, Czech Power Works, NPP Temelín, IAEA 1992

QARAT Mission Report, IAEA 1993

Report of the Consultant Meeting Design Modification of Temelín NPP, IAEA 1994

Temelín Fire Safety Mission Final Report, IAEA 1996

OSART Mission to NPP Temelín, IAEA 2001

12.8.3 ÚJV Řež a. s.

WATRP Report to Programme of Development of Deep Geological Repository, Waste R&D Plans and Projects, IAEA 1993

12.8.4 SÚJB

Reduced Scope International Regulatory Review Team (IRRT) Mission to Czech Republic, March 2000

Report of the International Regulatory Review Team (IRRT) Mission to Czech Republic, June 2001

12.9 Other – Czech Uranium Industry

12.9.1 Competence of the State Administration Bodies

Materials produced from mining activities and, subsequently, materials and activities related to the reduction program in the uranium (as well as ore and coal) mining administered by the national enterprise DIAMO are subject to legislative acts issued by MPO. The competence of state administration bodies has been assigned as follows:

- SÚJB, as a state administration body competent under § 3 paragraph 2 letter b), d), o) and the following of the Atomic Act and under § 9 paragraph 1 letter l) of the same Act, shall issue decisions:
  - on nuclear materials handling:

- in category – natural uranium in form of uranium concentrate,
- for quantities in tons,
- for permitted method of use e.g. purchase, sale and storage.

– on handling of sources of ionizing radiation (performance of services to assure monitoring in agreement with a monitoring program),

– on definition of controlled areas – dumping grounds for radioactive materials (e.g. uranium concentrate),

– on permits for decommissioning of tailing ponds, workplaces with very significant sources of ionizing radiation, their decommissioning with dismounting and removal of the construction (i.e. liquidation of free water from the tailing ponds, and removal of sediments, land reclamation etc.).

SÚJB, as a state administration body competent under § 3 paragraph 2 letter d), o) and the following of the Atomic Act, shall also approve:

– classification of transported nuclear materials in the respective category from the viewpoint of physical protection,

– method of physical protection assurance in transport of nuclear materials (chemical concentrate of uranium).

- An environmental department of the respective district office, competent under § 2 of Act No. 130/1974 Coll., as amended later, as a water management body, shall issue decisions – permits to discharge wastewater, mining water and other waters into public water courses.
- A building department of the respective town (or higher) office and building department for the uranium industry shall issue e.g. building inspectors approval for constructions (as well as removal of constructions) within the reduction program in the mining industry administered by the state enterprise DIAMO.
- A respective (regional) hygienic officer under Decree No. 20/2001 Coll., on creation and protection of healthy living conditions, as amended later, shall issue decisions on e.g. definition of high-risk workplaces.
- Respective regional departments of the Ministry of Agriculture, as a state administration body for forests, competent under § 14 paragraphs 1 and 2 of Act No. 289/1995 Coll., as amended later, shall approve plans for land reclamation to perform forest function e.g. in liquidation of chemical extraction of uranium in Stráž pod Ralskem.

12.9.2 Inventory

The state enterprise DIAMO Stráž pod Ralskem, as a representative of the uranium industry ČR, deposits materials from mining and treatment of uranium ore containing or contaminated with natural radionuclides, in the mining locations into dumps and tailing ponds. The activity is performed based on Act No. 61/1988 Coll., on mining activities, explosives and state mining administration, as amended later, and based on Act No. 44/1988 Coll., on protection and utilization of mineral riches (Mining Act), as amended later.

Establishing and operation of dumps and tailing ponds and management of materials containing or contaminated with radionuclides shall be considered a mining activity under § 2 of Act No. 61/1988 Coll. Also any directly related activity is considered a mining activity and any resulting materials are defined as materials from mining activities. Consequently, the activity is considered management of materials from mining activities and not radioactive waste management.

Materials from mining activities may be divided into the following two groups:

- materials generated directly during the mining and milling of uranium ore and from treatment of mining waters, i.e. waste rock, sludge from uranium ore treatment and sludge from mining water treatment.
- materials, contaminated with radionuclides as a result of the contact during uranium ore mining, transport and treatment, i.e. contaminated process equipment, contaminated buildings, contaminated working clothes, aids etc.

A dump is a ground structure formed by systematic deposition of waste rock (from the underground treatment or mine plant) on the assigned area, which is a part of the auxiliary operations zone of the mining facility.

A tailing pond is a natural or artificially developed area on the ground for permanent or temporary placement of mostly hydraulically stored sludge (sediments and process leftovers from ore treatment); a tailing pond includes a dike system and viewed as a water management work.

Dumps and tailing ponds resulting from mining activities and containing minerals are under § 4 of the Mining Act also considered mineral deposits.

The state enterprise DIAMO manages dumps and tailing ponds the mining locations listed in the sub-sections below.

12.9.2.1 Closed Mining Location Stráž pod Ralskem

- Mine Hamr I – out of operation, a part of the land rehabilitated and reclaimed.
- Tailing pond of the chemical treatment plant Stráž (stage I and II) – out of operation, rehabilitation works have been under way.

12.9.2.2 Operating Mining Location Dolní Rožínka

- Mine Rožná I – in operation, used for waste rock from the uranium mining and other materials from mining activities.
- Pits for uranium mines in the Moravian ore region – out of operation, most of the land rehabilitated and reclaimed.
- Tailing pond of the chemical treatment plant Rožná – K I in operation, used for sludge from uranium ore treatment and other materials from mining activities. Tailing pond Zlatkov – K II is out of operation.

12.9.2.3 Closed Mining and Treatment Facilities in Příbram, West Bohemia and Mydlovary

- The uranium mines in Příbram – out of operation, processed to form crushed aggregate. A part of the land has been rehabilitated and reclaimed.
- Tailing pond for the treatment plant Dubno – K I in operation to deposit sludge from treatment and washing of crushed aggregate. Tailing pond K II is out of operation and the land has been partly reclaimed.

- Mines and tailing ponds for the uranium mines in West Bohemia , including old loads – out of operation, selected mines are used to produce crushed aggregate, other rehabilitated and the land reclaimed. The old loads are represented by mines and tailing ponds for the former mines in Jáchymov, with insufficient rehabilitation measures.
- Tailing pond of the chemical treatment plant Mydlovary – out of operation, extensive rehabilitation and reclamation works have been under way on the tailing ponds.

12.9.3 Human and Financial Resources

To assure radiation protection and safety in management of materials from mining activities (mining and treatment of uranium ore), containing or contaminated with radionuclides, the state enterprise DIAMO has a sufficient number of highly professionally qualified personnel and the appropriate technical equipment.

To improve radiation protection and safety in the management of materials from mining activities the enterprise has introduced a certified quality management system under the ČSN EN ISO 9001:1995 standard.

Financial resources necessary to meet the statutory requirements for nuclear safety and radiation protection in implementation of gradual reduction of uranium mining and to smooth away its consequences, are guaranteed by the state budget approved by the Czech government for each applicable year.

12.9.4 Existing Facilities and Past Practices

The existing facilities to dispose materials from mining activities, containing or contaminated with radionuclides, managed by the state enterprise DIAMO, include mines and tailing ponds. The mines were established usually in the immediate vicinity of deep underground mines and were used mostly for waste rock from uranium mining. Tailing ponds were developed near uranium ore chemical treatment plants to dispose sediments and process leftovers from uranium ore treatment. Apart from the mentioned materials, the mines and tailing ponds were also used to dispose other materials from mining activities, containing or contaminated with radionuclides. Before decommissioning the tailing ponds have been also used to dispose materials generated in the process of liquidation of mines, treatment plants and related facilities and also sludge from mining water treatment.

In addition to the effect on the original landscape character and occupation of farming or forest land the most serious risk associated with operation of the mines and tailing ponds have been the air pollution with emissions and underground water pollution. The quality of air was adversely affected by high dusting, particularly in windy weather from dried tailing pond beaches. Apart from fine fractions of the deposited materials the air was also contaminated with particles containing e.g. aluminum–sulphate and calcium–sulphate salts or uranium and radium. Underground waters are often contaminated by seepage from mines and particularly from tailing ponds built in the past without sufficient isolation from permeable subbase. Seepage water and atmospheric water contain uranium, radium, heavy metals, flotation agents and other chemical and dissolved substances, depending on the composition of mined and processed ores, which in contact with underground waters mostly adversely influence their quality.

At the moment only the mines and tailing ponds in Rožná (Dolní Rožínka) are in operation for uranium mining purposes. These facilities to deposit materials from mining activities fully meet requirements of applicable regulations and their safety and radiation protection meet the current international standards. The other mines and tailing ponds managed by the state enterprise DIAMO have been out of operation as the mining has ended and rehabilitation and reclamation works have been under way there.

12.9.5 Location of Proposed Facilities

The state enterprise DIAMO has not proposed or planned construction of any new facilities.

12.9.6 Designing and Construction

The existing mines and tailing ponds were designed, founded and constructed in agreement with the regulations and standards (Mining Act, Building Act, Water Act, Decree No. 59/1972 Coll., hygienic standards etc.) valid from 1950 to 1980. The specialized Uranium Industry Design Institute performed designing works and building companies specializing in uranium industry performed construction works.

12.9.7 Safety Assessment

Before commissioning a mine or tailing pond a standard process of assessment, approval and final inspection was performed, attended by representatives of respective administration authorities and bodies of state professional supervision. Safety of each facility was assessed within the mentioned process of approval and commissioning, which was a product of its time.

12.9.8 Operation

The operation of mines and tailing ponds is subject to applicable generally binding legal regulations. The operation of mines and tailing ponds is only possible with the approval and in agreement with the conditions specified in a decision of the respective administration authority and bodies of state professional supervision. Professionally qualified personnel in agreement with the given regulations and operating and handling rules of the facility shall manage the operation. The operation shall include as its integral part technical and safety supervision and monitoring of the working environment and surrounding environment, including monitoring of quantities, parameters and facts important from the viewpoint of radiation protection.

12.9.9 Basic Measures after Decommissioning

Measures after decommissioning of the mines and tailing ponds as repositories for materials from mining activities containing or contaminated with radionuclides, are in detail described in a technical design for liquidation of each facility. One of the basic criteria for the measures after decommissioning is to assure adequate nuclear safety radiation protection of persons and the environment. Before implementation, each decommissioning design is assessed, commented on and approved with the involvement of administration authorities and bodies of state professional supervision. The approval process also includes a licence by SÚJB on decommissioning and evaluation of impacts on the environment.

The mines are usually removed in part of completely, reformed to be in line with the surrounding ground level and subsequently reclaimed using technical and biological means.

Rehabilitation measures in the tailing ponds primarily include stabilization of the dike system, removal of a water lagoon, if any and filling the remaining free space; this is followed by technical and biological rehabilitation. The pond is then covered with a suitable inert material to reduce ionizing radiation from the deposited material containing or contaminated with radionuclides. The respective administration authority in agreement with generally binding legal regulations establishes limits and conditions for its safe operation.

In the course of rehabilitation measures implementation the working environment and the surrounding environment are monitored, including quantities, parameters and facts important from the viewpoint of radiation protection. After completing rehabilitation works a long term monitoring is conducted to verify effectiveness of the adopted measures, in agreement with a program approved by the body of state professional supervision.

12.9.9.1 Activities Planned to Improve Safety

To improve radiation protection and safety in management of materials from mining activities containing or contaminated with radionuclides, the state enterprise DIAMO is planning to introduce the environmental management system under ČSN EN ISO 14001 and the program „safe company“. The continual improvement of the already introduced quality management system under the standard ČSN EN ISO 9001:1995 and its re-certification under ČSN EN ISO 9001:2000 is taken for granted.

To improve safety and radiation protection the state enterprise DIAMO is planning to install technological equipment for retreatment of the so-called balance sludge from mining water treatment.

Another measure which is supposed to improve radiation protection and safety during obliteration of consequences of mining activities, is to employ the process of environmental impacts assessment required by law, which is also applicable to the mines and tailing ponds.