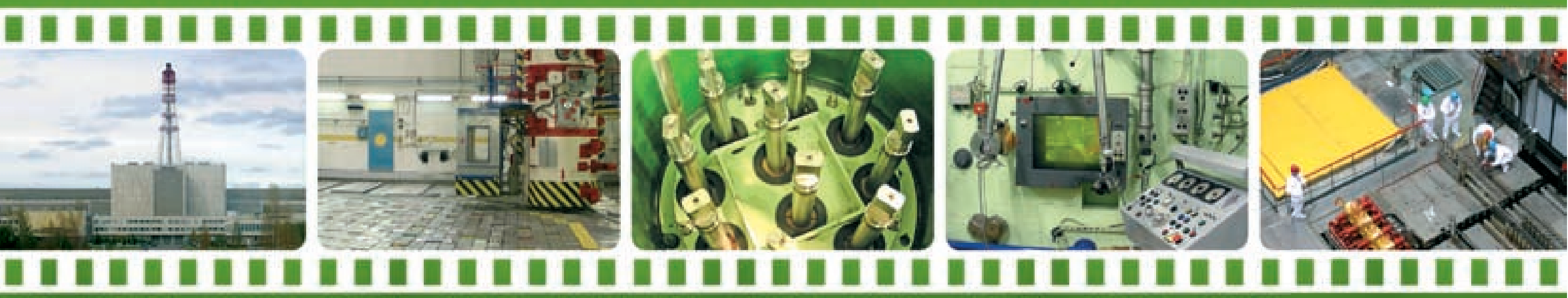
# Joint Convention on the Safety of Spent Fuel and on the Safety of Radioactive Waste Management



**Second National Report of Lithuania in accordance with Article 32 of the Convention**

**2008**

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# LIST OF ABBREVIATIONS

DP – Decommissioning Project;
DSS – Disused Sealed Sources;
DMSD – Decommissioning Management System & Database
DW – Drainage Water;
EIA – Environmental Impact Assessment;
EDW – Emergency Drainage Waters;
HC – Hot Cell;
HLW – High Level Waste;
IAEA – International Atomic Energy Agency;
INPP – Ignalina Nuclear Power Plant;
LILW – Low and Intermediated Level Waste;
LILW-LL – Low and Intermediated Level Waste Long-Lived;
LILW-SL – Low and Intermediated Level Waste Short-Lived;
SFSF – Spent Fuel Storage Facility
NPP – Nuclear Power Plant;
RPC – Radiation Protection Centre under the Health Ministry;
RATA – State Enterprise Radioactive Waste Management Agency;
RWMF – Radioactive Waste Management Facility;
RWMSF – Radioactive Waste Management and Storage Facility;
SAR – Safety Analysis Report;
SF – Spent Fuel;
SNFSF – Spent Nuclear Fuel Storage Facility;
SPH – Storage Pools Hall;
SRW – Solid Radioactive Waste;
QAS – Quality Assurance System;
VATESI – State Nuclear Power Safety Inspectorate;
VLLW – Very Low Level Waste;

# SECTION A. INTRODUCTION

### *Aim of the report*

Lithuania has signed this Convention on 30 September 1997 and ratified it on 18 December 2003. This Convention entered in force in Lithuania on 14 June 2004.
This is the second report of Lithuania for this Convention. The aim of the report is to give the information on the fulfillment of obligations of this Convention to other Contracting Parties. This report will be discussed in the Third Review Meeting to be held in Vienna on 11-22 May 2009.
This report was prepared according the Guidelines Regarding the Form and Structure of National Reports. It takes into account questions to the first Lithuanian report also challenges and plans to improve safety indicated in Reporter's Report for Lithuania prepared during the Second Review Meeting.

Summary of major changes in the area of spent fuel and radioactive waste management in Lithuania since the presentation of last report are presented in Section L.

### *Sources of radioactive waste*

#### *1. Nuclear power plants*

There is only one nuclear power plant (NPP) in Lithuania - Ignalina NPP. It is situated in the North-East of Lithuania near the borders of Latvia and Belarus, on the bank of the largest Lithuanian water-body, Drūkšiai Lake. The INPP has two units of RBMK-1500 reactors. RBMK-1500 is the last and the most advanced version of RBMK-type reactor design series (actually only two units were constructed).

The INPP reactors were commissioned in December 1983 and August 1987 respectively. The original design lifetime is projected to 2010-2015. After the accident in Chernobyl, the safety systems were re-evaluated and it was decided to decrease the maximum thermal power of the units from 4800 to 4200 MW. That limits the maximum electric power to about 1250 MW per unit. The INPP is and, for the foreseeable future, will be a vital component in Lithuania's energy balance because it is producing more than 80 % of the total electricity production in Lithuania. There are a variety of reasons for this high percentage, but the main cause is a significantly lower production cost at the present economical and technical circumstances in the Lithuanian power sector.

#### *2. Isotope applications*

The number of radioactive sources in Lithuania is continually decreasing - in implementing new technologies many of enterprises discontinue to use their sources (they are being replaced by other equipment). When the radioactive sources are declared as disused, and if they are not returned to supplier then they are sent to the INPP radioactive waste interim storage facility.

According to the Law on the Management of Radioactive Waste, State Enterprise Radioactive Waste Management Agency (RATA) is responsible for taking radioactive sources from small waste producers, when sources are declared as disused and considered as radioactive waste, but not returned to supplier. From the moment of transfer of disused sealed source from small waste producer to RATA, RATA is taking responsibility to manage radioactive waste.  Then RATA transfers sources to INPP for storage. INPP is responsible for the radioactive waste from the moment of receiving them.

***Specific items regarding radioactive waste management in Lithuania***

It should be noted that according to the Law on Nuclear Energy the spent fuel in Lithuania is radioactive waste.

All radioactive waste management facilities in Lithuania are considered nuclear facilities. The operators have to have a license in order to operate these nuclear facilities. All these facilities are situated in the territory of INPP, only one exception is Maišiagala storage facility, which is about 30 km northwest from the capital of Lithuania Vilnius. All facilities in Lithuania are licensed.

The operator of radioactive waste management facilities is fully responsible for the safety of these facilities. INPP is responsible for the safe management of radioactive waste produced during operation or accepted for storage or processing, and produced during decommissioning until this waste is transferred for disposal. RATA is responsible for management and disposal of all radioactive waste transferred. RATA is the operator of the assigned storage facilities and repositories.
The legislative and regulatory system in Lithuania is non-prescriptive. The regulators are responsible for supervising all steps of radioactive waste management.

## SECTION B. POLICIES AND PRACTICES

***Article 32: Reporting, paragraph 1***

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 the established strategy for Radioactive Waste Management.*

A revised Strategy on Radioactive Waste Management was approved by the Government of Lithuania on September 3, 2008. Its objective is to define a radioactive waste management policy. This strategy is approved to implement the provisions of the Law of the Republic of Lithuania for Radioactive Waste Management, which establishes the basic principles of Radioactive Waste Management. The Law states that management of radioactive waste must ensure that:

1) at all stages of the radioactive waste management, individuals, the society and the environment within Lithuania as well as beyond its borders, are adequately protected against radiological, biological, chemical and other hazards that may be associated with radioactive waste by applying the appropriate methods;
2) efforts are made to prevent future generations from any reasonably predictable impact greater than those permitted for the current generation and to avoid any undue burden for future generations;
3) the generation of radioactive waste is kept to the lowest practicle minimum;
4) interdependencies among the different steps in the radioactive waste management are taken into account;
5) the safety of radioactive waste management facilities is guaranteed during their operating lifetime and there after.

The strategy has three main objectives:

1. Strive to achieve a high level in nuclear and radiation safety in management of spent fuel and radioactive waste;
2. To improve the radioactive waste management infrastructure, which shall be based on modern technologies; strive to minimize activity and volume of radioactive waste;
3. Informing the Lithuanian public to achieve a better understanding of the main radioactive waste management principals and achieve acceptance of waste management projects.

Compared with previous and revised strategies, there are no changes in main strategic. The difference is that the strategy has been restructured and some elements were reworded.

*(i) spent fuel management policy;*

According to the Law on Environmental Protection (1992, last amended 2003), in the Republic of Lithuania, both the reprocessing of radioactive material used for the production of nuclear weapons or for fuel elements of nuclear power plants, and the reprocessing of spent nuclear fuel is prohibited. The amount of spent fuel is relatively small and taking into account environmental issues, it was decided to prohibit reprocessing of spent nuclear fuel in the territory of Lithuania.

According to the Law on the Management of Radioactive Waste (1999, last amended 2004) spent fuel is categorized as radioactive waste. The following measures are foreseen in the Strategy on Radioactive Waste Management for the management of spent fuel:

- To construct a new spent fuel storage facility;
- To transfer spent fuel from INPP to the dry storage facilities;
- To analyse the possibilities to dispose spent fuel and long-lived radioactive waste in Lithuania or to reprocess or dispose it in other countries;

*(ii) spent fuel management practices;*

Storage of spent nuclear fuel (SF) at INPP is performed by means of two methods. "Wet" storage in spent fuel storage pools near the reactor and "dry" storage in the detached storage facility at NPP territory. Wet storage was provided in the initial design of NPP. NPP's design was developed in the 70ies of the last century in the former Soviet Union. It was intended to store the fuel unloaded from the reactor for several years and then to transfer it for processing. In the beginning of the 90ies, when it became finally obvious that the matter of spent fuel processing is not considered any more, a decision was made to build up a dry type interim storage for spent nuclear fuel at INPP and store it for 50 years.

*(iii) radioactive waste management policy;*

The policy for management of solid radioactive waste (SRW) of INPP is the following:

1. Within the years 2002-2010 it is foreseen to modernize the management and storage of solid short-lived and long-lived radioactive waste of INPP and to:

- reduce both the total activity and volume of radioactive waste, for such purpose to implement best available technologies;
- implement the new classification system for radioactive waste;
- arrange a licensed landfill for disposal of very low level waste;
- retrieve and characterize radioactive waste accumulated in existing storage facilities and perform the required conditioning and transfer of solid short-lived radioactive waste to storage facilities or perform proper treatment of long-lived radioactive waste;
- establish and implement the radioactive waste inventory record keeping system;
- strive towards clearance of the radioactive waste as much as possible;
- perform investigations and initiate projects suggesting methodologies for calculation of conditional clearance levels and best management practices for materials with contamination exceeding unconditional clearance levels.
- get ready to dispose solid short-lived radioactive wastes from INPP in a near surface repository.
- establish proper interim storage facilities and store long-lived radioactive waste in these facilities without final immobilization until the final disposal methods are decided.

The policy for management of liquid radioactive waste of INPP is the following:

1. Liquid radioactive waste should be solidified and waste forms should be enclosed into suitable containers as required for storage, transport, and disposal in the near surface repository.
2. Spent resins and sludge shall be cemented.
3. Investigations shall be performed and it shall be decided whether the bituminized radioactive waste storage facility could be converted into a repository or not. Depending the decision, the bituminized radioactive waste storage facility shall be licensed as a repository or the bituminized waste shall be retrieved and enclosed into suitable containers as required for storage, transport and disposal in the near surface repository.
4. A suitable technology for treatment of spent oil shall be chosen.

Gaseous waste processing systems shall ensure the removal from off-gases the radioactive contaminants as aerosols, noble gases and iodine under both normal and abnormal conditions to levels permissible to discharge effluents in accordance with requirements set in regulatory document Limits of Discharge of Radioactive Substances from Nuclear Facilities and Basic Requirements for Monitoring of Radioactive Effluents and Monitoring of the Environment, as defined in the Lithuanian standard LAND 42-2007, "Environmental Protection of the Lithuanian Republic".

The policy for management of institutional radioactive waste is the following:

1. Disused radioactive sealed sources shall be managed separately from other radioactive waste. These disused radioactive sealed sources that could not be reused or sent back to the supplier shall be treated without the final immobilization until the acceptance criteria for disposal are established.
2. Radioactive waste generated by enterprises in bankruptcy, waste without owner, illegitimate radioactive waste, and orphan sources, shall be collected, treated and temporary stored at INPP storage facilities.

*(iv) radioactive waste management practices;*

Solid radioactive waste generated at INPP is segregated into three groups according to the surface dose rate to standards that were applied in the former USSR and applicable at INPP. The new classification is approved in 2001 however, a transition period and the new waste management facilities required for the implementation of the new system. Both waste classification systems are described in item (v).

Brief description of waste according to its content

- Group I waste.

Waste with insignificant contamination, generated as a result of Units' operation on nominal power, equipment repair works, and refurbishment of rooms.
Content (roughly): paper, cotton waste, pieces of cable, filters and parts of repaired equipment, construction waste, rubber and thermal insulation.

- Group II waste.

Waste generated as a result of repair works, small volumes of operational waste generated in the central hall and in the spent fuel cooling pools hall.
Content (roughly): depreciated equipment, parts of equipment, pipelines, and elements of structures from non-serviced rooms.

- Group III waste.

The main constituents are the parts retrieved from the reactor core. Content (roughly): elements of fuel assemblies, fuel channels, CPS channels, sensors, etc.

The solid waste at INPP is disposed of into reinforced concrete compartments in storage buildings No. 155, 155/1, 157, 157/1 located on the INPP site. Currently, storage buildings 157 and 157/1 are under operation. There is no reprocessing of solid waste before it is dumped. Part of the Group I combustible/compactable waste is compacted with a 70 ton press.

Liquid radioactive waste at INPP is collected in special tanks, from where it is transferred into evaporating facilities. The concentrate is processed and conditioned in the bitumen solidification facility, i.e. mixed with bitumen. The bitumen compound then is pumped into a special storage (building 158). The building is also located at the INPP site.

Spent ion-exchange resins filter aid (perlite) and part of evaporator concentrate with solid particle sediments are not processed and stored in special tanks, from where it is transferred into cementation facility. The final cement solidified waste product is a compound of liquid radioactive waste and the dry components cement and bentonite. The compound is poured into metallic 200 l drums. The filled drums are placed into reinforced concrete storage containers, each containing 8 drums. VATESI license No.1/2006 for operation of the cementation facility and temporary cementation waste storage has been received in 2006.

Since 1964 all radioactive waste from the research, medical and industrial institutions was sent to disposal facility at Maišiagala but that facility was closed in 1989. Since then, all collected institutional waste is stored at the INPP storage facilities. The Maišiagala facility was originally designed as a final repository however, recent safety assessment showed that the facility meets only temporary storage facility requirements. RATA received a VATESI license for post closure surveillance of the closed Maišiagala storage facility.

*(v) criteria used to define and categorize radioactive waste.*

Radioactive waste in Lithuania is defined as spent nuclear fuel and substances contaminated with or containing radionuclides at concentrations or activities greater than the approved clearance levels and for which no further use is foreseen.

Radioactive waste in the Republic of Lithuania is classified according to the disposal principle and radiological characteristics. According to the Regulation on the Pre-disposal Management of Radioactive Waste at the Nuclear Power Plant VD-RA-01-2001 the following waste categories are distinguished:

**Very Low Level Waste (VLLW).** Radioactive waste with radiological characteristic values exceeding clearance levels, however, lower than the characteristics for low level waste. VLLW will be disposed in licensed landfills.

**Low and Intermediate Level Waste (LILW).** Radioactive waste with radiological characteristics between those of very low level waste and high level waste. These may be long-lived waste (LILW-LL) or short-lived waste (LILW-SL).

**High Level Waste (HLW).** The radioactive liquid containing most of the fission products and actinides present in spent nuclear fuel – which forms the residue from the first solvent extraction cycle in reprocessing – and some of the associated waste streams, this material following solidification, spent nuclear fuel or any other waste with similar radiological characteristics.

Unconditional clearance levels are established by the Normative Document LAND 34 – 2000 "Clearance Levels of Radionuclides, Conditions of Reuse of Materials and Disposal of Waste" (2000).

Solid radioactive waste is classified into six classes.

**Table B-1: Solid waste radiological classification**

| Waste classes | Definition | Abbreviation | Surface dose rate mSv/h | Conditioning | Disposal method |
|---|---|---|---|---|---|
| *Short lived low and intermediate level waste** | | | | | |
| A | Very low level waste | VLLW | ≤0.5 | Not required | Very low level waste repository |
| B | Low level waste | LLW-SL | 0.5-2 | Required | Near surface repository |
| C | Intermediate level waste | ILW-SL | >2 | Required | Near surface repository |
| *Long lived low and intermediate level waste*** | | | | | |
| D | Low level waste | LLW-LL | ≤10 | Required | Near surface repository (cavities at intermediate depth) |
| E | Intermediate level waste | LW-LL | >10 | Required | Deep geological repository |
| *Spent sealed sources* | | | | | |
| F | Disused sealed sources | DSS | | Required | Near surface or deep geological repository*** |

* Containing beta and/or gamma emitting radionuclides with half-lives less than 30 years, including $Cs^{137}$, and/or long lived alpha emitting radionuclides with measured and/or calculated, by using approved methods, activity concentration less than 4000 Bq/g in individual waste packages on condition that an overall average activity concentration of long lived alpha emitting radionuclides is less than 400 Bq/g per waste package

** Containing beta and/or gamma emitting radionuclides with half-lives more than 30 years, not including $Cs^{137}$, and/or long lived alpha emitting radionuclides with measured and/or calculated, by using approved methods, activity concentration more than 4000 Bq/g in individual waste packages on condition that an overall average activity concentration of long lived alpha emitting radionuclides exceeds 400 Bq/g per waste package.

*** Depending on acceptance criteria applied to sealed sources

Liquid radioactive waste shall be classified and segregated according to:

(a) The specific activity - in low level ($\leq 4 \cdot 10^5$ Bq/l) and intermediate level ($> 4 \cdot 10^5$ Bq/l) waste;
(b) The chemical nature - in aqueous and organic waste;
(c) The phase state - in homogeneous and heterogeneous waste.

It shall be noted, that the radioactive waste classification system introduced in 2001 is applied for new radioactive waste treatment facilities. Currently, at INPP classification of radioactive waste comply with the old regulations of the Soviet Union (SP AS-88). A transition period is required for the implementation of the new system at INPP. The new classification compliant with VD-RA-01-2001 shall be adopted after the modernization of radioactive waste management system at INPP and will be operational at the new waste management facility.

Hence, currently solid radioactive waste is classified according to Table B-2. In practice only surface dose rate is applied.

**Table B-2: Radioactive waste classification**

| **Waste group** | **γ-dose rate at 0.1m distance from the surface (mSv/h)** | **Total activity Bq/kg** | **Total activity Bq/kg** | **Surface contamination (particle/ $cm^2$min)** | **Surface contamination (particle/ $cm^2$min)** |
|---|---|---|---|---|---|
| | | β- emitter | α- emitter | β- emitter | α- emitter |
| I low | $1x10^{-3}$÷0.3 | $7.4x10^4$-$3.7x10^6$ | $7.4x10^3$-$3.7x10^5$ | $5.0x10^2$-$1.0x10^4$ | 5.0-$1.0x10^3$ |
| II medium | 0.3 ÷ 10 | $3.7x10^6$-$3.7x10^9$ | $3.7x10^5$-$3.7x10^8$ | $1x10^4$- $1.0x10^7$ | $1x10^3$- $1.0x10^6$ |
| III high | over 10 | over $3.7x10^9$ | over $3.7x10^8$ | over $1.0x10^7$ | over $1.0x10^6$ |

According to fire hazard (for group I - II waste):

- combustible
- non-combustible

According to possibility to reduce volume by compaction:

- compactable
- non-compactable

Liquid radioactive waste is classified into three groups according to specific activities:

- Low level - ≤ $3.7\times10^5$ Bq/l
- Intermediate level - $3.7\times10^5$ – $3.7\times10^{10}$ Bq/l
- High level - > $3.7\times10^{10}$ Bq/l.

## SECTION C. SCOPE OF APPLICATION

***Article 3: Scope of application***

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

There are no reprocessing facilities of spent nuclear fuel in Lithuania. According to the Law on Environment Protection, such kind of activity is forbidden. Spent fuel from INPP is stored for several decades at the storage facility.

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 containing only naturally occurring radioactive materials not originating 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.*

The Lithuanian Hygiene Standard HN 73:2001 states the following requirements for protection in case of applications using natural and artificial sources (where natural sources are or have been used for their radioactive or other properties):

- Production, processing, use, storage, transport, import, export of radioactive substances and management of the radioactive waste;
- Activities with substances containing natural radionuclides when exemption criteria are not applied.

Lithuanian Hygiene Standard HN 85:2003 "Natural Exposure; Standards of Radiation Protection" provides detail radiation protection requirements, in case of natural exposure. Besides of other practices, this document regulates radiation protection for natural exposure in case of processing materials, containing natural sources, in case of managing radioactive waste occurring in processing thereof and in other applications, when activities or specific activities of natural radionuclides in occurring materials is above the exempted levels.
At present, there are no such activities in Lithuania, which could produce radioactive materials, in which natural radionuclides could be found (for example, like those occurring in mining).

*3. This convention shall not apply to the safety management of spent fuel or radioactive waste within military or defense programmes, 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 programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.*

According to the Law on Environmental Protection, such kind of activity is not allowed in Lithuania. There is no spent fuel or radioactive waste from military or defense programmes.

## SECTION D. INVENTORIES AND LISTS

***Article 32: Reporting, paragraph 2***

*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;*

*Wet storage for spent fuel*
Immediately after the unloading from the reactor until the transfer to interim dry storage the SF is stored in spent fuel storage pools near the reactors of the NPP.
The complex of storage pools for the spent fuel storage and its handling system comprises of 12 pools. They are as follows:

- two pools (Rooms 236/1, 236/2), intended to store spent fuel assemblies after they are taken from the reactor;
- five pools (Rooms 336, 337/1, 337/2, 339/1, 339/2), intended to store spent fuel fragmentized assemblies placed in baskets;
- pool (Room 234), intended to accumulate spent fuel assemblies prepared to be fragmentized, to cut suspension brackets from the spent fuel assembles, transport spent fuel assembly to the hot cell and 102 placed transport baskets from the hot cell to the storage pools, store the 102 placed transport baskets when the storage pools hall (SPH) is under repair;
- two pools (Rooms 338/1, 338/2), intended to perform operations to load the transport baskets with the spent fuel assemblies into the transport casks and store the 102 placed transport baskets when the SPH is under repair;
- transport corridor (Room 235), intended to transport spent fuel assemblies and transport baskets loaded with spent fuel assemblies between the pools;
- transport corridor (Room 157), intended to transport fresh fuel and reactor assemblies from the fresh fuel assembly preparation bay of SPH to the reactor and return spent fuel and reactor assemblies from the reactor to the storage pools.

The equipment of the spent fuel storage and handling system is installed in the reactor building.

The spent fuel assembly extracted from the reactor and spent fuel bundles in casks are stored in the storage pools, which ceilings that enter into the SPH. All process operations related to handling of the spent fuel are performed in the spent storage pools hall. The fuel assembly remains in the pool for at least a year, after which it may be removed to be cut. The cutting bay is located in the reactor building between the SPH and reactor hall. The bay includes a hot cell, control room and maintenance area and is designed to:

- Cutting spent fuel assemblies into halves (two fuel bundles);
- Putting them into a transport 102 placed basket;
- Cutting long parts of fuel assemblies into smaller pieces (central rod, bearing tube).

Before and (or) after the spent fuel assembly is being cut, it is to be stored in the pool for

5 years. When the time limit for storage of the assembly after taking it from the reactor is reached, the 102 placed transport baskets with spent fuel are loaded into the casks and transferred for a long-term (up to 50 years) storage to the on-site spent fuel storage facility.

“Dry” storage for spent fuel.

The dry fuel storage facility is located at the INPP site within a distance of 1 km of the INPP units and 400 meters of the Drūkšiai Lake.

It is a dry storage facility where the spent fuel is stored in the same casks it is transported to the facility CASTOR RBMK and CONSTOR RBMK.

The storage is designed for 20 CASTOR RBMK casks and 78 CONSTOR RBMK casks. At present (status date 2008-03-01) a modification is in progress to increase the storage capacity up to an additional 22 CONSTOR RBMK casks.

The primary buildings and structures for the spent fuel storage are as follows:

- A platform to store full casks in the open air fenced with the shielding concrete wall (Structure 192);
- Personnel access control and accommodation building (Building192A);
- Transformer sub-station (Building193);
- Industrial and administrative building (Building194)
- Rain accumulators and special sewer systems (Building 195);
- Check-point (Building 196)
- Gate control building (Building 196A);
- Monitoring boreholes (Observation);
- Power supply system;
- Technical applications and security system;
- Radiation and dose-rate monitoring system;
- Motorways and railways.

The Spent Nuclear Fuel Storage Facility (SNFSF) is fenced in perimeter with the shielding reinforced concrete wall and supported by the triple fence equipped with an alarm system.
The process structures are located behind the shielding reinforced concrete wall, which ensures secure operation of the facility. The platform to store the casks of CASTOR RBMK and CONSTOR RBMK in the vertical position is located between the rails of the girder crane.
The storage is a passive storage system, which does not require the decay of heat from any auxiliary equipment.
The girder crane ГК-100 with lifting capacity of 100 t performs the cask handling and loading activities. The casks are placed on the reinforced concrete plate in groups with the distance between the casks centers of 3 meters from each other. The distance between the cask groups is adequate to 4.1 meters.
The perimeter of the storage site is equipped with a continuous radiation monitoring system the signals thereof being transferred into the Radiation Monitoring Control Room.

*(ii) an inventory of spent fuel that is subject to this Convention and that is kept in storage or that 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;*

As of 2008-03-01, the SNFSF contained 20 CASTOR RBMK casks and 74 CONSTOR RBMK casks, with a total of 9588 spent fuel elements (4794 spent fuel assemblies) of RBMK type, with uranium enriched to no more than 2%. The total activity of the spent fuel that is stored at the dry spent fuel storage facility is of 2.86E9GBq.

As of the end of 2007, the inventory of spent fuel was: 7071 fuel assemblies in the pools of Unit 1 and 6219 fuel assemblies in the wet storage pools of Unit 2. The amount of heavy metal (HM) in one assembly is 112-114 kg.

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

The facilities listed below are located on the site of INPP. These facilities are used for operational waste from INPP and for the waste from small producers in Lithuania. The volume of the waste from small producers is only about 1-2 $m^3$ per year, so more than 99% of radioactive waste in Lithuania is produced at INPP.

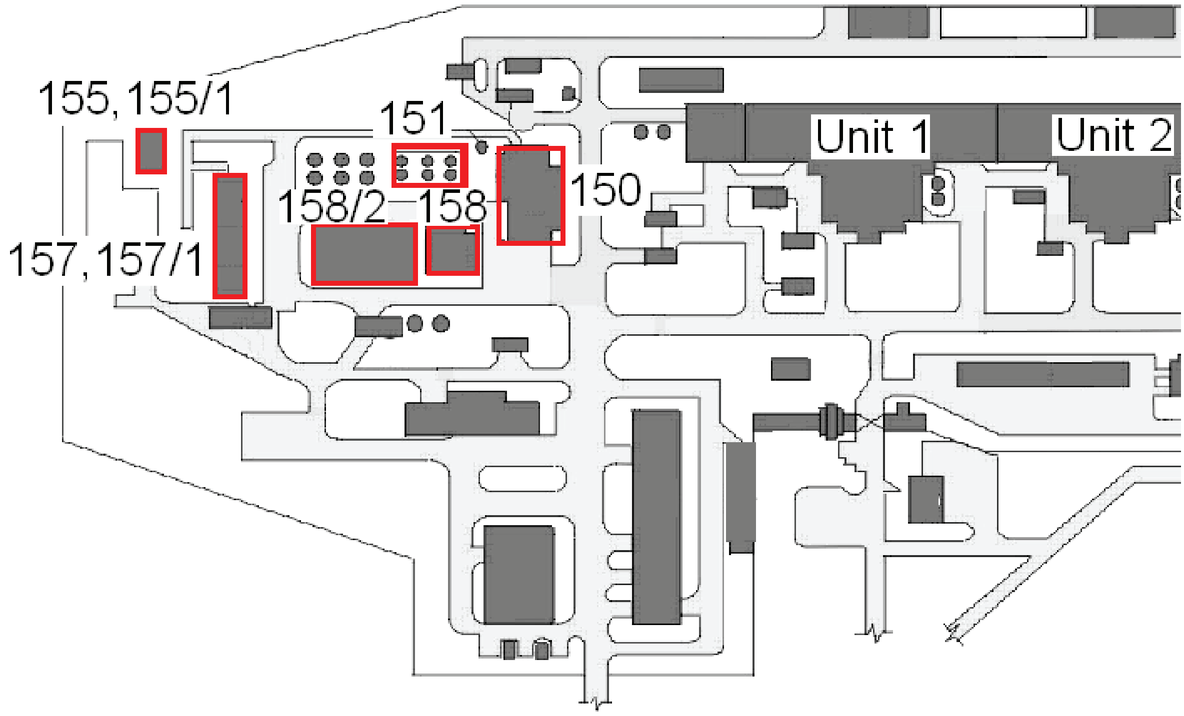


**Figure D-1. Layout of radioactive waste facilities at INPP**

**Brief technical specification of the solid waste storage and management facilities at INPP**

***Storage facility*** ***Building 157***

Building 157 is a reinforced concrete ground structure. The bottom part is a reinforced concrete slab; external walls are pre-cast concrete panels. Standard reinforced concrete building blocks were used to reach the required thickness of the walls. The structure is separated into 15 compartments with pre-cast concrete partitions. The ceiling is made of cast-in-place concrete. Group I and II waste (according old classification of the radioactive waste) is loaded into the compartments through 6x4.5 m square apertures. Group III waste is loaded through 1200 mm round apertures (6 per each compartment) covered by reinforced concrete plugs. Asphalt concrete hydraulic insulation is used to conserve the compartments' covering. Compartments with combustible solid radioactive waste are equipped with fire alarm and automatic carbon dioxide fire extinguishing system. At the moment the automatic fire extinguishing system is switched to manual carbon dioxide supply mode.

***Storage facility*** ***Building 157/1***

Building 157/1 is a reinforced concrete ground structure, consisting of three separate blocks. The distance between the blocks is 1 meter. The bottom part is a reinforced concrete slab; external walls are made of cast-in-place concrete in retained framework. The structure is separated with pre-cast concrete partitions into 29 compartments. The covering is made of cast-in-place concrete and has 6x4.5 m apertures. Asphalt concrete hydraulic insulation is used to conserve the compartments' covering. The covering over compartment No. 8 is made of cast-in-place concrete covered with metal liner and has one 1000x830 mm aperture used to load containers with filters. Compartments with combustible solid radioactive waste are equipped with fire alarm and carbon dioxide fire extinguishing system.

***Storage facility*** ***Building 155***

Building 155 is a composite reinforced concrete ground structure. The bottom part is a reinforced concrete slab; external walls are reinforced concrete panels. Additional concrete protection is introduced inside. Metal panels are used as covering. Asphalt concrete hydraulic insulation is used to conserve the structure's covering. As for today, the building is completely filled with waste and conserved.

***Storage facility*** ***Building 155/1***

Building 155/1 is a composite reinforced concrete ground structure. The bottom part is a reinforced concrete slab; external walls are reinforced concrete panels. Cast-in-place concrete in retained framework is used inside to introduce additional biological shielding of the walls. Two pre-cast concrete partitions are used to separate the building into three compartments. Two compartments are 12x21 m each; the third one is 6x21 m. The covering is made of metal panels of 3x10.5 m that can be removed to load waste into the compartments. Asphalt-concrete hydraulic insulation is used to conserve the structure's covering. Inside and outside the building there is a fire extinguishing system. There is a pit provided to collect atmospheric precipitation inside the building. As for today, the building is completely filled with waste and conserved.

***Storage facility*** ***Building 151 (Liquid waste)***

The water purification and liquid waste treatment systems of INPP generate liquid radioactive waste. Waste is collected and stored in three 1,500 $m^3$ metal lined concrete tanks which are located above ground level and covered with soil. The waste is stored in three storage tanks denoted as TW18 B01, TW18 B02 and TW11 B03 in building 151. The waste accumulated in storage tanks TW18 B01 and TW11 B03 consists of ion exchange bead resins and filter aid (perlite) mixture in water with very low salt content. The volume of the waste in these two tanks is 2286 $m^3$. The waste accumulated in storage tank TW18 B02 consists of evaporator concentrate with solid particle sediments and filter aid (perlite); the volume of the waste is 1460 $m^3$.

***Bituminisation facility*** ***Building 150***

The purpose of this facility is to condition the operational liquid waste from INPP.

The first bituminisation unit BU-1 was commissioned in 1986 and the second, BU-2 in 1993. The design capacity of the bituminisation unit is 0.5 $m^3/h$ of evaporator concentrate. The units are located in building 150.

The units mix radioactive salts into pure bitumen. A thin film of evaporates with specific activity of $3.7\times10^5$ Bq/l - $3.7\times10^7$ Bq/l and pure bitumen is mixed into bitumen compound with specific activity of $3.7\times10^5$ Bq/l -$3.7\times10^6$ Bq/l.

The process of the collection of the liquid radioactive waste and the subsequent bituminisation at INPP is presented in Figure D-2. The contaminated water from different sources is accumulated in storage tanks. After evaporation in units EU-1, 2, the residual, evaporated concentrate, is accumulated. The bituminisation is carried out with two bituminisation units and the bitumen compound is transferred by heated pipeline to the storage canyons (cells) of building 158.

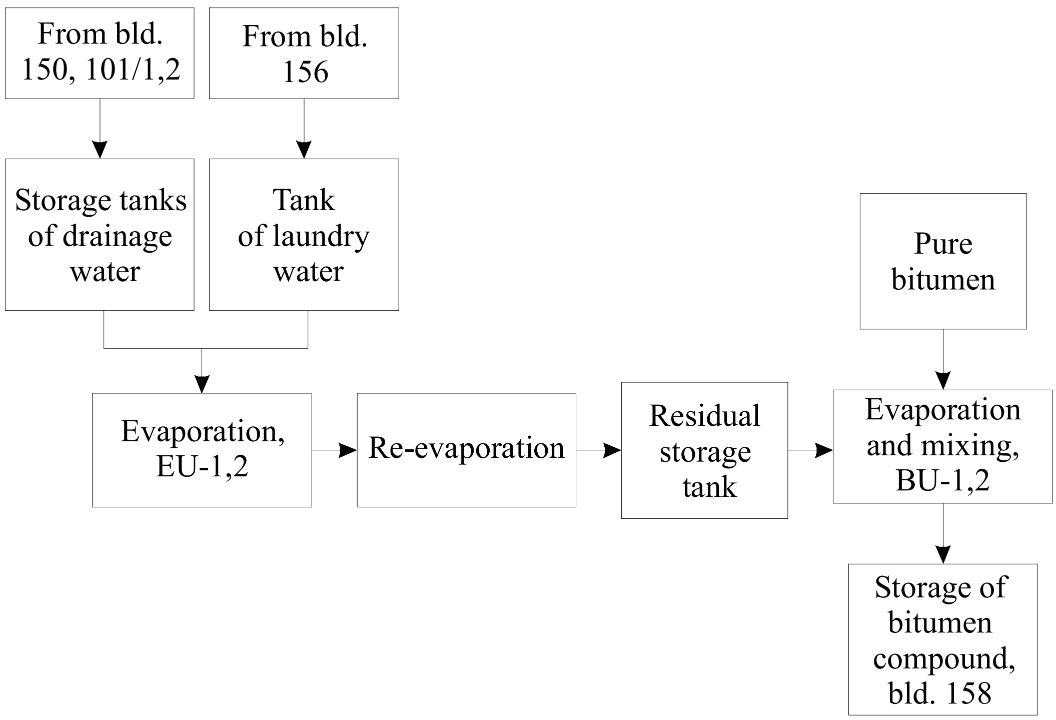


**Figure D-2. The process of the collection of the liquid radioactive waste and the following bituminisation at INPP**

***Storage facility*** ***Building 158 (Bituminised waste)***

The bituminised waste storage facility, building 158, is located in the Northwest side of the INPP site, 200 m. to the West of unit 1. The facility is a two-storey building with supporting walls and radiological shielding by concrete blocks. The foundation is made of monolithic reinforced concrete slabs. The first floor contains 11 canyons (cells) with a volume of 2500 $m^3$, each and an effective volume of 2000 $m^3$. One canyon has a volume of 1000 $m^3$ and an effective volume of 800 $m^3$. The second floor contains a servicing hall, pipe-shaped communication channels with pipelines and instrumentation rooms. A gallery with three communication channels for bitumen compound pipelines joins the storage building with the liquid waste treatment facility (building 150).

The potential conversion of the existing bituminized waste storage facility into a final repository is under investigation. INPP should complete their studies by 2011

***Cementation facility Building 150***

The new liquid waste cementation facility started operation in March 2006. The ion-exchange resins from INPP water purification and liquid waste treatment systems together with filter aid (perlite) as one waste mixture type and solid particle sediments from evaporator concentrate also with filter aid (perlite) as another waste mixture type are solidified in cement which is poured into drums and put in storage containers (waste packages) in order to reduce any further risk associated with the liquid waste storage in tanks and to assure safe storage and management of solidified waste.
The cementation facility is designed to process approximately 450 $m^3$ of liquid radioactive waste per year. A total amount of 6000 $m^3$ liquid radioactive waste is envisaged to be processed. In addition to the accumulated liquid radioactive waste already in storage, the liquid waste which will be generated during future operation of INPP and potentially also during future decommissioning of INPP shall be processed.

The cement-waste mixture is captured into 200 l drums. The filled drums are capped and then loaded into a concrete storage container. Each storage container has a storage capacity of 8 drums.
The storage containers are designed for shielding and protecting the loaded drums against mechanical loadings. For transport from the cementation facility to the building 158/2 the filled storage container is placed into a transport container.

***Storage Building 158/2 (Cemented waste)***

The cemented waste is stored in building 158/2. This facility started operation in 2005. The building 158/2 is three-bay shop reinforced concrete structure. The design basis for the storage building is to provide storage capacity for waste packages produced from a total quantity of 6000 $m^3$ of liquid processed radioactive waste for duration of 60 years. The capacity is 6300 storage containers. The volume of the container is about 5.6$m^3$.
The cementation facility and building 158/2 are designed in such a way that in normal operation only a very small amount will be added to the discharge of radioactive substances from the overall INPP site, so that the radiation exposure due to these facilities will be negligible.
During 2006-2007 152.4$m^3$ of ion-exchange resins and perlite were reprocessed, 214 casks have been put for storing.

***Maišiagala storage facility***

A Maišiagala radioactive waste storage site is located near the village of Maišiagala, about 30 km North-West of Vilnius. The storage was designed for institutional waste disposal and it is a typical former USSR *Radon* type facility that has been constructed in the early 1960s in all the Republics of USSR. In Lithuania it was built in 1964 and closed in 1989. From 1973 till 2002 maintenance of the facility was under the responsibility of the Institute of Physics. In 2002 this responsibility was transferred to RATA. An institutional control of the storage includes physical protection, environmental monitoring and public information activities.
Waste is stored in a reinforced concrete vault with internal dimensions 14.75x4.75x3 m

(volume 200 $m^3$). The vault was only partially filled with waste during operation (about 60% of the volume). The waste was inter-layered with concrete. Sealed sources are stored in stainless steel containers. At the time of closure the residual volume was filled with concrete and sand. In 2004-2006 the Maišiagala storage was essentially upgraded by installing new radiological and physical protection barriers. The post closure surveillance license was obtained in 2006.

Institutional waste generated up to 1989 is stored in Maišiagala storage. The waste consist of static electricity neutralizers and neutron generators, an assortment of chemical compounds, gamma radiation sources with their shielding, different isotopic instrumentation with beta sources, blocks of gamma re-lays, radium salts, radioactive light emitters and fire sensors, radioactive sources, high-activity gamma sources with their biological shielding. The radionuclides important for long term safety assessment are H-3, C-14, Cl-36, Co-60, Sr-90, Cs-137, Eu-152, Ra-226 and Pu-239.

*(iv) an inventory of radioactive waste that is subject to this Convention that:*

*(a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;*

Principal information about waste volumes, activities and specific radionuclides in the storage buildings listed above is presented in the Annex 1 the Section L.

*(b) has been disposed of; or*

*(c) has resulted from past practices.*

The Maišiagala facility and the waste stored therein are the result of past practices. The historical waste from research, industry and medical institutions are accumulated in the Maišiagala storage facility. Total volume is about 200 $m^3$. Main radionuclides of the Maišiagala storage facility that are important for safety are provided in Table D-1 Inventory of Maišiagala storage facility is presented below:

**Table D-1: Main radionuclides of Maišiagala disposal facility**

| **Radionuclide** | **Activity, Bq 01 February 2007** |
|---|---|
| H-3 | 9,12E+13 |
| C-14 | 1,77E+11 |
| Cl-36 | 1,20E+09 |
| Co-60 | 6,76E+11 |
| Ni-63 | 3,65E+10 |
| Kr-85 | 6,9E+08 |
| Sr-90 | 4,18E+11 |
| Ba-133 | 1,25E+06 |
| Cs-137 | 3,68E+13 |
| Eu-152 | 2,13E+10 |
| Bi-207 | 4,53E+05 |
| Ra-226 | 1,10E+11 |
| U-234 | 1,45E+03 |
| U-238 | 4,31E+07 |
| Pu-239 | 9,15E+11 |
| **Total activity** | **1,44E+14** |

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

Unit 1 of INPP was shut down on 31 December 2004, and now this unit is being prepared for decommissioning. The second unit of INPP will be shut down at the end of 2009.

**The Final Decommissioning Plan**

In 2005 the Final Decommissioning Plan (FDP) was approved by the Ministry of Economy.

FDP includes the whole period of INPP decommissioning (Units, auxiliary equipment and interim storage facilities for spent fuel and waste). Based on the proposed strategy, decommissioning activities and projects are planned. FDP describes principles, methods, and technologies, as well as a general schedule, necessary for ensuring a radiological safe, ecological responsible and efficient decommissioning process.

**Decommissioning Project (DP) for INPP Unit 1 Final Shutdown and Defuelling Phase**

The Decommissioning Project for the INPP Unit 1 Final Shutdown and Defuelling Phase, including a Safety Analysis Report (SAR) and an Environment Impact Assessment (EIA), was prepared in August 2004. This project, SAR and EIA, were accepted by State competent authorities.

In June 2006 VATESI approved the DP for the INPP Unit 1 Final Shutdown and Defuelling Phase and its SAR. VATESI also arranged for a nuclear safety review of the project and submitted the conclusion of the review to the Ministry of Environment, which arranged the State Complex Expertise of the project. The conclusions of State Complex Expertise were issued in October 2006.

DP covers the work that will be performed within the framework of a prolonged operational license for INPP Unit 1. This project plan is one of the documents substantiating the permission for final reactor shutdown. The project plan serves a double purpose:

Establish regulations, in which:

- The systems (their parts) that are not needed any more are indicated, their further isolation/modification is described and that allow for reducing costs for the maintenance after shutdown of the Unit;
- In-line decontamination of the Main Circulation Circuit (MCC) and refueling machine is described (with the aim to reduce personnel exposure to radiation during further dismantling work performance).

Provide a planning guide in which all expenses of the described period are estimated (related not only to process activities, but also to operation of remaining systems, treatment of fuel and radioactive waste, and alls other preparatory works), as well as the need in man power, the exposure of personnel to radiation, the discharges into environment and the radiation impact on the population.

This DP does not cover dismantling work, since this will be performed within the framework of other dismantling and decontamination projects.

**Equipment Dismantling & Decontamination Designs Development**

After shutdown most of the INPP Units 1 and 2 systems and equipment, which do not relate to the provision of fuel cooling, defuelling, transfer and safe storage at the Units, can be dismantled. Only these systems that have process connections with systems, that provide safe treatment of the fuel, remain in operation. Also systems that provide normal conditions of systems that remain in operation and maintenance of the building (heating and ventilation, lighting, fire-prevention, drainage, etc.) will stay in operation. Engineering and licensing documentation necessary for permitting INPP personnel to perform the dismantling of the equipment taken out of operation from different buildings of INPP will be prepared.

The package of these projects includes:

- B9-0 "INPP Building 117/1 Equipment Decontamination and Dismantling Project Development";
- B9-1 "INPP Unit 1 Turbine Hall Equipment Decontamination and Dismantling Project Development";
- B9-2 "INPP Building V1 Equipment Dismantling & Decontamination Design Development";
- B9-5 "INPP Boiler House Equipment Dismantling & Decontamination Design Development";
- B9-6 "INPP Building 117/2 Equipment Dismantling & Decontamination Design Development";
- B9-7 "INPP Building G2 Equipment Dismantling & Decontamination Design Development";
- B9-8 "INPP Building V2 Equipment Dismantling & Decontamination Design Development".

The objective of Projects B9-0,1,2,5,6,7,8 is the development of engineering documentation (Basic Design and Detailed Design) and licensing documentation that will allow INPP personnel dismantling of INPP Units 1 and 2 equipment that are not necessary from the viewpoint of nuclear safety and operation.

In August 2007, the contract for the INPP building 117/1 equipment decontamination and dismantling project was signed with a consortium. In the beginning of 2008, the consortium submitted the optimal equipment dismantling and decontamination strategy for building 117/1, which is currently being reviewed by the INPP. This is the first significant step in development of the Basic Design.

In November 2007 the contract for the INPP Unit 1 Turbine hall equipment decontamination and dismantling project was signed with a consortium.

Contract award for the INPP building V1 equipment decontamination and dismantling project is planned for November 2008.

Dismantling of reactors can be started only once the equipment for radioactive waste treatment is prepared and the license of the appropriate state institutions has been received. Taking into account that dismantling of such type of reactor has not yet been performed in the world, the project B9-4 "INPP Units 1 and 2 Reactors Dismantling & Decontamination - Feasibility Study" will be implemented. The objective of this project is the development of the possible reactor dismantling strategy, development of a waste management strategy for waste resulting from reactor dismantling, the determination of equipment for dismantling and a preliminary evaluation of dismantling cost. These strategies will be the initial data for the development of the Basic Design for reactor dismantling.

**Tools and Equipment for Dismantling & Decontamination of System/Equipment Components**

Tools and equipment for dismantling of system/equipment components shall ensure safe dismantling of this INPP equipment (turbines, steam generators, drum separators, etc.) and preparation for further treatment/storage.

Tools/equipment for decontamination of system/equipment components shall ensure acceptable level of contamination for further treatment and disposal, to reduce the impact on personnel and to assure that the release of radioactive contaminants to the environment will be maintained within authorised limits during dismantling activities.

Projects, in which tools and equipment that will be applied for dismantling of INPP Units 1 and 2 buildings will be specified, will be initiated. The package of these projects will include**:**

B13 "Provision of Dismantling & Decontamination Tools for INPP Building 117/1";

B14 "Provision of Dismantling Tools for INPP Building G1";

B15 "Provision of Decontamination Tools for INPP Building G1";

B22 "Provision of Dismantling Tools for INPP Building V1";

B23 "Provision of Decontamination Tools for INPP Building V1";

B24 "Equipment and Consumables for In-line Decontamination at Unit 2".

B29 "Provision of Dismantling & Decontamination Tools for INPP Buildings A1, B1, Boiler House, 117/2, G2, V2";

B30 "Tools for Project B9-4 (Unit 1 Reactor Decontamination and Dismantling)".

# SECTION E. LEGISLATIVE AND REGULATORY SYSTEM

***Article 18: 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.*

Lithuania has taken all necessary legislative, regulatory and administrative measures implementing the obligations under this Convention. The legislature of Lithuania ensures safe management of radioactive waste and spent nuclear fuel. At the same time this legal basis is constantly in development, considering the present situation and changes in the country's nuclear energy field. The existing legislative situation in Lithuania is described below.

***Article 19: 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.*

Lithuania has established an appropriate legislative and regulatory framework in order to govern safety of spent fuel and radioactive waste management.
All the legal acts concerning spent fuel and radioactive waste management are prepared according best national and international practices, including IAEA recommendations. It covers all areas of spent fuel and radioactive waste predisposal management and disposal of very low level waste and disposal of low and intermediate level waste.

*2. This legislative and regulatory framework shall provide for*:
*(i) the establishment of applicable national safety requirements and regulations for radiation safety;*

The list of main legal acts regulating the management of spent nuclear fuel and radioactive waste in Lithuania is presented below:

**Laws:**

1. Law on the Management of Radioactive Waste (1999, last amended 2005);
2. Law on Nuclear Energy (1996, last amended 2006);
3. Law on Radiation Protection (1999, last amended 2004);
4. Law on Environmental Protection (1992, last amended 2005);
5. Law on the Ratification of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (2003);

**The Government Resolutions:**

6. Government Resolution No. 860 On Approval of the Strategy of Radioactive Waste Management (2008);

7. Government Resolution No. 103  On Approval of Regulations of Licensing of Nuclear Power Related Activities (1998);
8. Government Resolution No. 653 On Approval of Regulations of Licensing the Practices Involving Sources of Ionizing Radiation (1999, amended 2004);
9. Government Resolution No. 280 On Approval of Regulations on Management of Illegal (Orphan) Radioactive Sources and Facilities, Contaminated With Radionuclides (2005);
10. Government Resolution No. 651 On the Establishment of the State Register of Radiation Sources and Exposure to Workers and Approval of Its Statute (1999, amended 2007);
11. Governmental Resolution No 461 On Approval of Regulation on Providing of Data Concerning Activities Related with the Disposal of Radioactive Waste to the Commission of the European Communities (in compliance with the Article 37 of the Euratom Treaty) (2007).

**General requirements:**

12. Regulation on the Pre-disposal Management of Radioactive Waste at the Nuclear Power Plant, VD-RA-01-2001 (2001);
13. The General Requirements for Dry Type Storage for Spent Nuclear Fuel, VD-B-03-99 (1999);
14. Regulation on Disposal of Low and Intermediate Level Short Lived Radioactive Waste P-2002-2 (2002);
15. Regulation on Disposal of Very Low Level Radioactive Waste P-2003-02 (2003);
16. General Requirements for Quality Assurance System at NPP and other Nuclear Power Facilities, VD-KS-02-99 (1999);
17. Requirements for Modifications of Nuclear Facilities VD-E-08-2000 (2000);
18. Regulations of Nuclear Substance Accounting and Control in Nuclear and Non-Nuclear Objects, (1997);
19. The General Regulations for Nuclear Power Plant Safety, 1997;
20. Order of the Minister of Health No. V-834 On Regulations on Import, Export, Transit and Transportation of Radioactive Materials and Radioactive Waste (2004);
21. Order of the Minister of Health No. V-712 On Regulations of Decommissioning of the Objects in which Practices Involving Sources of Ionizing Radiation Were Executed (2003);
22. Order of the Minister of Health No. V-136 On Approval of Risk Categories of Potentially Dangerous Installations with Sources of Ionizing radiation and Their State Radiation Protection Supervision and Control (2005);
23. Order of the Minister of Health No. V-687 On Approval of Rules of Safety of the Sources of Ionizing Radiation (2005);
24. Order of the Minister of Health No. V-1020 On Approval of the Rules of the Control of Orphan Sources and Sealed Sources of High Activity (2005);
25. Lithuanian Hygiene Standard HN 89:2001 “Management of Radioactive Waste” (2001) (for institutional waste);

**Radiation protection requirements:**

26. Lithuanian Hygiene Standard HN 73:2001 “Basic Standards of Radiation Protection” (2001);
27. Lithuanian Hygiene Standard HN 85:2003 “Natural Exposure. Standards of Radiation Protection” (2003);

28. Lithuanian Hygiene Standard HN 87:2002 “Radiation Protection in nuclear facilities” (2002);
29. Lithuanian Hygiene Standard HN 99:2000 “Protective Actions of Public in Case of Radiological or Nuclear Accident” (2000);
30. Lithuanian Hygiene Standard HN 89:2001 “Radioactive waste management” (2001); (scope of the document is small producers)
31. Lithuanian Hygiene Standard HN 52:2005 “Radiation Protection in Industrial Radiography” (2005);

**Environment protection requirements:**

32. Normative Document LAND 34 – 2000 “Clearance Levels of Radionuclides, Conditions of Reuse of Materials and Disposal of Waste” (2000);
33. Normative Document LAND 41 – 2001 “Limitation of Radioactive Discharges from Facilities of Medicine, Industry, Agriculture and Research and Permitting of Discharges and Radiological Monitoring” (2001);
34. Normative Document LAND 42-2007 “Limitation of Discharges of Radionuclides from Nuclear Facilities, Permitting of Discharges and Radiological Monitoring” (2007).

The main strategic directions of the management of spent nuclear fuel and radioactive waste in Lithuania are provided in the Strategy of Management of Radioactive Waste, approved by the Lithuanian Government. The main provision of this Strategy is that in management of spent nuclear fuel and radioactive waste the efforts must be made to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation and to avoid imposing undue burdens on future generations.
The basic provisions for the management of spent nuclear fuel and radioactive waste are given in the Law on the Management of Radioactive Waste. This Law defines principles of radioactive waste management, competence of the authorities, duties and responsibilities of the waste producer, functions of the RATA and provisions for licensing.
The basic radiation protection and safety requirements, corresponding to IAEA requirements, also allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management are established in the Law on Nuclear Energy, the Law on Radiation Protection, Law on the Management of Radioactive Waste and the Law on Environmental Protection.
A new wording of the Regulation on Providing of Data Concerning Activities Related with the Disposal of Radioactive Waste to the Commission of the European Communities was adopted by the Governmental Resolution No 461 on 9 May 2007 (in compliance with Article 37 of the Euratom Treaty). The purpose is to clarify the procedure on data inventory preparation and coordination with the competent authorities. The responsibility to submit the data about planned activity to the European Commission was delegated to VATESI. The Environmental Protection Agency under the Ministry of Environment is obliged to submit the annual data on the radioactive liquid and atmospheric discharges and inform the Commission about discharges permissions and licenses issued for activities related with radioactive waste disposal.

*(ii) a system of licensing of spent fuel and radioactive waste management activities;*

Laws on Nuclear Energy and on the Management of Radioactive Waste define all activities that cannot be performed without having a license issued by the authority.
The Law on Nuclear Energy stipulates:

Without a license issued by the authority of the Republic of Lithuania in a prescribed manner, it is prohibited:

- To design, construct and reconstruct nuclear facilities, installations and equipment;
- To operate nuclear facilities and repair their protection systems;
- To engage in any activity that might have an effect on a safe operation of nuclear facilities;
- To retire a nuclear facility from service;
- To store and bury nuclear and radioactive materials and their waste;
- To acquire, possess and transport radioactive materials;
- To export, import and carry in transit in the territory of Lithuania nuclear, radioactive and other materials used in the nuclear energy sector, nuclear equipment, and dual purpose goods that may be used in nuclear technologies.

The Law on the Management of Radioactive Waste stipulates:

Without a license issued by the authority it is prohibited:

- To design, construct, or reconstruct, operate storage facilities and repositories, decommission storage facilities, to permanently close repositories and carry out post-closure surveillance;
- To engage in transport of radioactive waste;
- To collect, sort radioactive waste, to undertake its pre-treatment, treatment, and conditioning, to store, recover and decontaminate it.

The licensing process of radioactive waste management activities is not strictly centralized in Lithuania. According to the Law on the Management of Radioactive Waste the main regulatory body in radioactive waste management in Lithuania is VATESI. VATESI is responsible for issuing licenses for the design, construction, modification, operation and maintenance of nuclear facilities, and storage and disposal of radioactive waste.

Radiation Protection Centre (RPC) is responsible for issuing licenses for transportation of radioactive waste and for issuing licenses for small producers (waste producer with the exception of the operator of a nuclear plant) to manage institutional waste excluding disposal - to collect and sort radioactive waste, to undertake its pre-treatment, treatment, and conditioning, as well as to store, recover and decontaminate it. For the purpose of carrying out single transport of radioactive waste, in addition to the license, the single permit issued by the RPC is needed.

A scheme of licensing for construction or reconstruction, operation and decommissioning or closure of the radioactive waste management facility Radioactive Waste Management Facility (RWMF) in Lithuania is provided below:

## Construction or reconstruction

**The Ministry of Economy**
Submits to the Government draft of decision to design RWMF

↓

**The Government**
Decides to start designing of RWMF

↓

**Operator**
Application for license to design RWMF

↓

**VATESI**
Examines an application and issues the license to design RWMF after coordination with Ministry of Environment or its delegated institution, RPC and local municipality

↓

**Operator**
Prepares Design of RWMF and coordinates it with authorities

↓

**Ministry of Environment**
Organise State Expertise of RWMF Design

↓

**Operator**
Applies for the license for construction of RWMF

↓

**VATESI**
Examines an application and issues the license for construction of RWMF after coordination with Ministry of Environment or its delegated institution, RPC and local municipality and issues the license for construction

↓

**Operator**
Operator constructs the RWMF

## Operation

**Commission for the commissioning of RWMF designated by the Government**
Accepts constructed RWMF and issues an approval act

↓

**Operator**
Performs trials and sends to VATESI application for Operational License of RWMF

↓

**VATESI**
Examines an application and issues an Operational License for RWMF after coordination with Ministry of Environment or its delegated institution, RPC and local municipality.

## Decommissioning or Closure

**The Government**
Decides to decommission a storage facility or to close disposal facility

↓

**Operator**
Applies for the License

↓

**VATESI**
Examines an application and issues a License after coordination with Ministry of Environment or its delegated institution, RPC and local municipality within its territory

## Post-closure surveillance of the repository

**Operator**
Post-closure surveillance of the repository shall be exercised by RATA. RATA applies for the license for post-closure surveillance

↓

**VATESI**
Examines an application and issues a license for post closure surveillance after coordination with the Ministry of Environment or its delegated institution, RPC and local municipality within its territory

According the Law on Nuclear Energy Article 61, the operator of the nuclear facility must insure that the facility it operates or procures in some other way has the necessary funds for the compensation of potential nuclear damage. If the insurance and other funds are not sufficient for the compensation of such damage, the payment of the balance shall be guaranteed by the Government pursuant to the obligations assumed by the Republic of Lithuania according to the Vienna Convention. According the same Law, previous to issuing a license by the regulator for transportation of nuclear and radioactive materials (waste included), the applicant is required to provide an insurance policy or any other document guaranteeing compensation for damage in the event of a nuclear or radiological accident.
According the Article 30, paragraph 1, 2 and 3 of the Law on the Management of Radioactive Waste (amended in 2005), sealed sources might be imported into Lithuania, if it is planned to return them back to the supplier after their useful life. The recipient shall also agree with RATA for the management of radioactive sources that in case, due to unforeseen circumstances there are no possibilities to return the sources back to supplier, the source is insured for the value of RATA services. According to the licensing practice (for small users) agreement with RATA, insurance of the source for the value of RATA services is required before license to use the source will be granted.

*iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a license;*

According to the Law on Nuclear Energy, the Law on Management of Radioactive Waste and the Law on Radiation Protection it is prohibited to perform any activity related to the radioactive waste management in Lithuania without a license being granted. Otherwise the measures of enforcement described in the subchapter v) of Section E will be implemented.

*iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;*

Institutional control of nuclear facilities is ensured by the license given to the operator. The license conditions define all aspects the operator shall comply with. License conditions ensure that the control of the facility operator by the regulatory body will continue as long as the license is valid and even if the license is not valid anymore, the responsibility remains with the operator.

According to Article 13 of the Law on Nuclear Energy, the bodies exercising government control and supervision shall inspect the status of nuclear safety, radiation protection and physical safety of nuclear facilities, and, within the scope of their competence, shall take all necessary measures for the elimination of the identified defects.

Decisions taken by officers of government control and supervisory bodies within the scope of their competence shall be binding for all natural and legal entities and shall be implemented strictly within the established time limits and in accordance with the prescribed procedure.

VATESI as the main regulatory body in spent fuel and radioactive waste management in Lithuania, has issued an internal document General Procedure of VATESI's Inspection. This document clearly defines the procedure of inspections of VATESI in nuclear facilities. It gives the guidelines for preparation, implementation and documentation of inspections and defines what actions shall follow after inspection if some nonconformities or deficiencies are found. Every year VATESI approves its plan of inspections, according to which the intended inspections are implemented.

Pursuant to provisions of the Law on the Management of Radioactive Waste and the Law on Radiation Protection, the Radiation Protection Centre is in charge of government supervision and control for management of radioactive waste generated by small producers (institutional radioactive waste). It also supervises and controls how the requirements for exposure to workers and the public during normal operation and accident situations are being followed in the management of radioactive waste at nuclear facilities. The inspection order and frequency, are outlined in the Regulation for Radiation Protection State Supervision and Control (2000). Detailed inspection procedures (including inspection questionnaires and forms of inspection protocols) are established in the Manual on Radiation Protection State Supervision and Control (2004), approved by the Director of the RPC.

*v) the enforcement of applicable regulations and of the terms of the licenses;*

According to the Regulations for Licensing of Nuclear Power Related Activities approved by the Government, the licensing authority VATESI must take all necessary actions, including the sanctions (legal actions of the licensing authority to impose penalties in order to eliminate violation of conditions of the license, which can be administrative penalties) established by legislation in order to ensure that the licensee follows the conditions of license validity, requirements of nuclear safety regulations, and additional requirements of the licensing authority. VATESI has the right to oblige the licensee to eliminate all observed deficiencies of the activity and (or) violations of license conditions.

The regulatory authority has the right to suspend the license or revoke it before its expiry date if the licensee does not fulfill the conditions of the license, the requirements established by the regulations and (or) by the regulatory authorities (within their competence), seriously violates these regulations or submits incomplete or confusing information.

According to the Law on Radiation Protection and the Law on the Management of Radioactive Waste, licenses to small producers for the activities related to radioactive waste management (to collect, sort, undertake its treatment, store, reprocess, transport and decontaminate) are issued, radiation protection governmental supervision and control is carried out, and in case requirements are violated, administrative penalties (according the Code of Administrative Violations) are applied by the RPC.

*(vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management;*

Article 4 of the Law on Nuclear Energy stipulates that the safe operation of individual nuclear facilities shall be the responsibility of their operators. A radioactive waste management facility is a nuclear facility. The operator is responsible for all steps and aspects of radioactive waste management in the nuclear facility.

Small producers are responsible for all steps of radioactive waste management according to the Law on the Management of Radioactive Waste.

Article 11 of the Law on the Management of Radioactive Waste stipulates:

It shall be the duty of a waste producer to manage radioactive waste safely, in accordance with norms and regulations, before transferring it to the Radioactive Waste Management Agency. Following the receipt by the Radioactive Waste Management Agency from the waste producer, the Agency assumes responsibility for the management of the waste.

The waste producer shall pay all the expenses involved in the management of radioactive waste from the moment of its generation to its disposal, including the expenses related to scientific research, the upgrading of the radioactive waste management facility, as well as the post-closure surveillance of the repository.

The waste producer shall not be exempt from the duties and responsibilities to manage radioactive waste safely even in the event of a temporary suspension or expiration of the license.

*3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.*

Radioactive waste in Lithuania comprises spent nuclear fuel and substances contaminated with or containing radionuclides at concentrations or activities greater than clearance levels for which no further use is foreseen. This definition complies with the definition of radioactive waste and with the objectives of this Convention.

***Article 20: Regulatory body***

*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 fulfil its assigned responsibilities.*

According to the Law on Nuclear Energy, Article 8, the Government of the Republic of Lithuania shall prepare the nuclear safety and radiation protection regulatory system and the mechanism of its functioning, establish nuclear energy control and supervision institutions and approve their regulations. Article 64 states that the implementation of the governmental regulatory objectives of nuclear energy safety and radiation protection as well as the activities of the control and supervision bodies shall be financed from the national budget.

There are three regulatory bodies in Lithuania.

According to the Law on the Management of Radioactive Waste VATESI is the key institution regulating the safety of radioactive waste management.

VATESI's role and responsibilities are the regulation of safety of nuclear facilities and the supervision of accounting nuclear materials. Hence, it is responsible for supervision that the operator guarantees the protection of people and the environment from nuclear damage. VATESI therefore:

- approves technical regulations of the design and construction of nuclear facilities and maintenance of their structures, together with the Ministry of the Environment;
- approves standards and rules for operation of nuclear facilities, standards and rules for storage of radioactive materials used in nuclear energy and disposal of their waste and establishes the procedure for drafting standards and rules;
- prepares the state regulatory system for the accounting for and control of nuclear materials and ensures its viability;
- informs the mass media about the radiation and safety situation in nuclear facilities;
- co-ordinates and controls preventive measures for the staff and the public in the event of a nuclear facility accident, monitors the status of accident preparedness of the facility;
- imposes sanctions as established in statutory acts for violators of safety rules;
- co-ordinates the Radioactive Waste Management Strategy developed by RATA;
- co-ordinates the three-year programme of RATA;
- shall establish the criteria for the classification and acceptance of radioactive waste after consultation with the RPC and the Ministry of the Environment.

The Radiation Protection Centre (RPC) is an institution of the Ministry of Health. The Ministry of Health is responsible for approval of regulatory enactments and rules on the health of the personnel of nuclear facilities and the residents in the monitored zones of the facility and the control compliance thereof. Following the RPC:

- exercises state radiation protection supervision and control at the radioactive waste management facilities;

- issues licenses to obtain, maintain, use and transport radioactive materials, for management of radioactive waste by small producers (except of nuclear fuel);
- issues permits to transport radioactive materials and radioactive waste;
- takes part in issuing licenses (which are issued by VATESI) for construction, reconstruction, operation and decommissioning of nuclear facilities (including waste treatment, storage and disposal facilities);
- takes part in issuing licenses (which are issued by VATESI) to obtain, maintain and transport nuclear materials;
- takes part in issuing licenses (issued by the Ministry of Economy) to export, import as well as licenses for transit of nuclear, radioactive and other materials through the territory of Lithuania, as used for nuclear energy, and other materials used for nuclear energy, or dual-use items that can be used in nuclear technology;
- is responsible for assessment of radiation doses towards the public (in the vicinity of radioactive waste management facilities), the results of environmental monitoring, including food, drinking water, gamma dose equivalent, etc. For this purpose data from other government institutions involved in the environmental monitoring network are delivered to RPC, including the data from the INPP environmental monitoring.

The Ministry of Environment:

- establishes limits of radioactive discharges from economic entities into the environment, monitors compliance and establishes the procedure for discharge authorization;
- establishes the clearance levels for radionuclides, conditions for re-use of materials and disposal of waste;
- co-ordinates the process of environmental impact assessment of proposed economic activities and manages it methodically; makes decisions whether the proposed economic activities are allowed at the selected site as well as organises and co-ordinates environmental impact assessment in the transboundary context;
- organises, coordinates and performs governmental environmental monitoring and controls environmental monitoring of economic entities;
- exchanges monitoring information with other countries;
- takes part in governmental supervision and control of design and construction of nuclear facilities;
- takes part in the issuing of licenses for radioactive waste management activities according the procedures prescribed by legislation and other legal acts.

Above mentioned competences are established in the legislation for Nuclear Energy, Radiation Protection, Radioactive Waste Management, Environment Protection, Environmental Impact Assessment of the Proposed Economic Activity and Construction. More detailed description of competences is set forth in lower tier documents.

VATESI establishes requirements for nuclear safety and requirements for the content of a Safety Analysis Report (SAR) in its regulations. As the main licensing authority VATESI reviews all aspects of the SAR's particularly design considerations, facility operations, accident analysis for internal and external initiating events and other relevant documentation necessary for issuing licenses without any exceptions.

The Lithuanian Hygiene Standard HN 87:2002 "Radiation Protection in Nuclear Facilities" prescribes the content of documentation submitted for review to RPC. The main document (or section in SAR) for their review is the Radiation Protection Programme consisting the following issues:

1. Classification of working areas and access control;

2. Local rules, measures for supervision of safety at work and the organisation of the work;
3. Investigation levels of workers and dose constraints, monitoring of workplaces and individual monitoring of workers;
4. Personal protective equipment and its application;
5. Main premises, control systems for assurance of protection;
6. Measures for application of protective actions in case of an accident;
7. Application of the optimisation principle and measures for exposure reduction;
8. Order of workers health surveillance;
9. Order of workers mandatory training and instruction in radiation protection;

The Ministry of Environment is responsible for environmental protection issues. The requirements of environmental protection are set up in Lithuanian documents, called LAND's, which cover:

1. Clearance levels of radionuclides;
2. Conditions of re-use of materials and disposal of waste;
3. Limitation of radioactive discharges from medical, industrial, agricultural and research facilities;
4. Limitation of radioactive discharges from nuclear facilities;
5. Permitting of discharges and radiological monitoring in nuclear facilities.

The Ministry of Environment as competent authority coordinates the EIA process. This process is described in separate documentation governed by Law on Environmental Impact Assessment of the Proposed Economic Activity. VATESI reviews Environment Impact Assessment Report in fields of nuclear safety and technology. RPC reviews radiation protection related matters.

Regarding the clearance procedure in Lithuania, the operator shall measure waste, intended for free release, ensuring that clearance levels are not exceeded. VATESI and the Ministry of Environment review and endorse the applied methodology for clearance levels. The Ministry of Environment is responsible for ensuring that clearance levels in cleared waste will not be exceeded. Cleared waste can be tested by inspectors from the Ministry of Environment through sampling. VATESI checks that the clearance criteria and methods of measurement are followed and evaluates the effectiveness of the instruments and methods used for clearance.

When reviewing licensing documents (SAR, EIA) every regulatory body has clear responsibilities assigned by laws and relevant legal documents and knows what items it shall review (see above given information). It means that VATESI reviews all nuclear safety relevant issues, RPC reviews radiation safety relevant issues related to radiation protection program and the Ministry of Environment reviews matters related release.

There are more ministries or institutions that are involved in regulating some specific questions in radioactive waste management according to their individual competences but these institutions are not regulatory bodies as defined in this Convention. These institutions are the Ministry of Economy, the Ministry of Social Security and Labour, the Ministry of Transport and Communications, the Ministry of National Defense, the Ministry of the Interior, the State Security Department and the Governmental Emergencies Commission. The competences of these institutions are defined in the Law on Nuclear Energy. According to this Law they participate only in one step of licensing – government expertise when evaluating the design of nuclear facility.

**Summary of regulatory bodies' responsibilities**

In order to simplify the overview of the competences of regulatory bodies in Lithuania regarding radioactive waste management it could be noted that VATESI is the key regulatory body in this field which issues licenses in all areas of radioactive waste management except for transport of the waste and management of radioactive waste for small producers (institutional waste). RPC issues licenses for transport of the radioactive waste and for management of radioactive waste for small producers (institutional waste) except the disposal of this waste. RPC is responsible for ensuring that occupational dose limits in the waste management facilities will not be exceeded. The Ministry of Environment is responsible for ensuring that limits of discharge into the environment for these facilities will not be exceeded and for the control of radiological monitoring and supervision of construction itself.

Responsibilities of regulatory authorities are clarified in legal acts. Therefore, duplication of authorizations is impossible. Interaction between regulatory bodies takes place by the co-ordination of licensing process for nuclear facilities, the regulation of discharges and the transport activities according to the limits of competencies. If some misunderstandings arise between regulatory bodies during these processes, meetings are organized for clarification which will be documented.

Financial resources for regulatory bodies are provided by the budget of the Republic of Lithuania.

*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.*

Operators and regulators in Lithuania are fully independent. Neither of the regulators performs any activity related to the radioactive waste management. Their functions are limited to regulating waste management. Article 14 of the Law on Management of Radioactive Waste stipulates that "In performing its functions VATESI shall act independently, in accordance with laws, its own regulations and other legal acts".

## SECTION F. OTHER GENERAL SAFETY PROVISIONS

### *Article 21: Responsibility of the license holder*

*1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.*

The main provisions, describing duties and responsibilities in management of spent nuclear fuel and radioactive waste, are established in the Law on Nuclear Energy, the Law on Radiation Protection and the Law on the Management of Radioactive Waste.

According to Article 4 of the Law on Nuclear Energy, the safe operation of individual nuclear facilities shall be the responsibility of their operators. In the license issued for the operator there is always emphasized that the licensee is fully responsible for the safety in the nuclear facility and even if the license is suspended the responsibility rests with the operator. The licensee shall provide safety reports of the operation of nuclear facilities to regulatory bodies, so that the regulator always knows if the licensee meets its responsibility. To evaluate if the licencee undertakes proper measures in ensuring safety of management of spent nuclear fuel and radioactive waste, and evaluate how safety measures are implemented inspections are carried out. Any changes in practice are co-ordinated with regulatory authorities and are only allowed upon assurance that safety requirements will be not violated.

The duties and responsibilities of small producers in management of radioactive waste are set forth in the Regulations of Licensing the Practices Involving Sources of Ionizing Radiation. Before issuing the license, it is ensured that licensee has all administrative and technical possibilities to carry out its operations with sources of ionizing radiation in a safe manner and (or) can safely manage radioactive waste.

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

Article 4 of the Law on Nuclear Energy stipulates that nuclear safety in the Republic of Lithuania shall be guaranteed by the State. If there are non-licensed facilities from former operations then there is an institution that performs surveillance of this facility until this facility will be transferred to the operator. The operator then performs assessment of the facility and applies for the license. For example, Maišiagala storage was managed in such a manner. At first it belonged to several institutions, and then it was transferred to RATA. RATA performed a safety assessment of the facility and received a license for post-closure surveillance of this facility.

If the licensee does not meet the requirements or does not follow the license conditions, the license is suspended but the responsibility remains with the operator.

### *Article 22: Human and financial resources*

*(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;*

The process of selection and training of personnel at INPP is performed in accordance with the second level quality assurance system procedures that guarantee sufficient skills of personnel involved in all fields of activity at INPP, including spent fuel and radioactive waste handling.
Safety management procedures "Personnel" QA-2-014, "Reactor core control and fuel handling" QA-2-012 and "Radioactive waste, maintenance of order" QA-2-013, which regulate requirements to personnel involved in spent fuel and radioactive waste handling activities, are developed in accordance with IAEA documents 50-C-QA (Rev.1), 50-SG-QA1 (Rev.1), 50-C\SG-Q and TRS No. 380 "Nuclear Power Plants' personnel training and its assessment".
Training and continuous education of personnel is performed on the basis of a systematic approach to education, providing the highest level of personnel training.
The procedures regulate requirements to:

- Personnel recruitment;
- Initial training of personnel;
- Personnel certification;
- Leave for independent work;
- Continuous education;
- Constant work with personnel.

All activities regarding on personnel recruitment, initial and continuous training of personnel, professional development, personnel certification and career development are performed in order to provide INPP with sufficient number of skilled personnel for safe and reliable operation of the plant.

The personnel of RATA are managed according RATA's Quality and Environmental Management System, in particular management procedure PR-RATA-07 "Personnel Management". The management system guarantees qualification and competences of personnel involved in all fields of RATA activity. The procedure has foreseen activities as short term and long term staff quantity planning, verification of staff competence, description of responsibilities, recruitment and selection of employees, assignment to a position and training. In order to prepare for disposal of low and intermediate level waste and to operate near surface repository, RATA has an EU project for competence building in this field.

*(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;*

Financing systems for management of radioactive waste and spent fuel are multiple in Lithuania. Management of an operational radioactive waste and spent fuel, control of existing facilities and storage in INPP is included in the production expenditures of the enterprise.

New facts.
New management facilities, which are or will be built under the INPP Decommissioning Programme, such as solid radioactive waste management and storage facility, spent nuclear fuel storage, landfill and near surface disposal facilities and others, are being financed by the Ignalina International Decommissioning Support Fund, Ignalina Programme and co-financed by the State Enterprise INPP Decommissioning Fund.

The State Enterprise INPP Decommissioning Fund is accumulated in the special Treasury Account from 6 % of the annual INPP revenue received from sold electricity. The Council of the Fund was founded by the Regulation of the Government and is the governing body of the Fund.
The Ignalina International Decommissioning Support Fund is accumulated by the contributions of the country-donors, and one of the main contributors is European Commission. The European Bank for Reconstruction and Development is an administrator of the fund, while the governing body is the Donors Assembly.
The Ignalina Programme is financed by the European Union budget. The Ignalina Programme was created under Protocol 4 of the Act of Accession of Lithuania into the European Union in order to provide assistance for the decommissioning of INPP (including radioactive waste management) and consequential measures in the energy sector. The European Commission by its decisions provides funding under the Ignalina Programme through two channels - the Ignalina International Decommissioning Support Fund and the National Agency in Lithuania (Central Project Management Agency). The funding is based on annual commitments. Therefore a radioactive waste management project which lasts more than 1 year will be financed only on a step by step basis for separate stages.
Institutional waste producers pay for their waste collection, transport, treatment, and storage and disposal services according to a contract with RATA. The fees of the services were approved by the Order of the Minister of Economy.
According the Law on the Management of Radioactive Waste, an operator of a radioactive waste management facility must take the appropriate steps to ensure that sufficient qualified staff and adequate financial resources are available during the decommissioning. It is obligatory, during the decommissioning of a radioactive waste management facility.

The Ignalina Programme constitutes a new financing instrument for the radioactive waste management. With endorsement of the Government of Lithuania, the Central Project Management Agency (CPMA) has been designated by the European Commission to act on its behalf as the National Agency of the 2007–2013 Ignalina Programme. The CPMA is an agency of the Ministry of Finance of Lithuania.
Projects that have received the favourable opinion of the Nuclear Decommissioning Assistance Programme Committee and approval of the European Commission are contracted through the CPMA in accordance with the Lithuanian Public Procurement Law. The Republic of Lithuania takes responsibility and provides full financial guarantees to the European Commission in respect to activities of the CPMA.
Imperfection of this financing source lies in annual commitments which cover separate stages of a project, instead of an entire project as a whole.

*(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;*

RATA is performing control and monitoring of the closed radioactive waste storage facility near Maišiagala, which was considered as a repository and was inherited from the Soviet Union. The facility's surveillance is financed by the State Budget of the Republic of Lithuania through the Ministry of Economy.

***Article 23: Quality assurance***

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

**National Requirements**

According to the requirements of the Law on Nuclear Energy, the Government established the licensing procedures and appointed national authorities that are responsible to inspect implementation, application and effectiveness of the quality assurance measures in nuclear energy operating organisations.

VATESI is responsible for establishing the requirements and evaluation of their implementation and adjustments. In 1999 VATESI issued national requirements on quality assurance (VD-KS-02-99). The requirements are based on IAEA code 50CSG-Q on quality assurance and other recommendations; it also requires implementing valid national standards for quality management systems (e.g. LST EN ISO 9001:2001). The new edition of the VATESI requirements is now under preparation taking into account the new international practices and the transitional stage of INPP.

VATESI requirements on quality assurance (VD-KS-02-99) apply to all organisations operating nuclear facilities, including organisations performing radioactive waste management activities (hereafter operators).

According to the national requirements all operators are required to implement effective quality assurance programmes (quality management systems). Operators are responsible to maintain and constantly demonstrate efficiency of their quality assurance programs in all stages of their operations:

"2.1 In order to ensure safety of nuclear power plants and other nuclear energy objects, it is very important that in all stages of their operation a quality assurance system would be established and implemented. Requirements for quality assurance system of nuclear plants and other nuclear energy objects are the main normative document, establishing requirements of VATESI for preparation, implementation and maintenance of quality assurance system in neo." *(from VD-KS-02-99).*

General VATESI requirements on decommissioning include the requirement for pro-active adjustment of quality assurance system as necessary for decommissioning (VD-EN-01-99, amended in 2003). It requires from an operator to extend the existing quality assurance system to include all decommissioning activities (section 5.8 within VD-EN-01-99).

According to VD-KS-02-99, quality assurance documentation including internal and external audit programmes, the nuclear facility operator shall submit level 1 and level 2 quality assurance system documentation to VATESI for review before the documents enter into force. Reports on internal audits and copies of regular reports of the quality management division to the executive of the operating organization, shall also be submitted to VATESI. The requirements also define that VATESI representatives have the right to take part as observers during execution of internal audits of the quality assurance system and to perform external audits of the quality assurance system within divisions or in the whole operating organisation.

RPC is responsible to monitor how small producers establish and implement quality assurance measures according to HN 73:2001 "Basic Standards of Radiation Protection" and that a safety culture encouraging licensees and workers to improve radiation protection methods that guarantee implementation of requirements on protection and assessment of quality control and efficiency of protection measures, shall be implemented. Small producers of radioactive waste in the quality assurance programmes:

- designate and appoint a person (service) responsible for establishment and implementation of the quality assurance programme;
- validate, that only persons with appropriate training will work with sources of ionizing radiation (or with equipment) and only approved procedures will be used;
- foresee the registration of and accountability for the implemented procedures;
- describe the method (procedures) of indoctrination of the workforce;
- indicate the necessary quality control procedures, including the frequency of inspection;
- indicate the method of calibration of sources (equipment) including reference standards, etc.

According to the requirements of HN 87:2002 ,,Radiation Protection in Nuclear Facilities“, the licencees ensure that all procedures assigned for the implementation of the radiation protection programme during operation and decommissioning of the nuclear facility, are performed in accordance with the requirements of the quality assurance programme of the nuclear facility.

**Status of Implementation of the national requirements**

Ignalina Nuclear Power Plant (INPP)

Management procedures "Reactor core control and nuclear fuel handling" (with 33 references to instructions, certificates and method descriptions) and "Radioactive waste, Order maintenance" (with references to 20 instructions and a regulation) have been implemented at INPP to control the processes of nuclear fuel and radioactive waste handling. The management procedures contain information necessary for administration to manage the following activities at INPP:

- Scope of application of the management procedure;
- Responsibility and authorities of the administration for the activity defined by the management procedure;
- Information on how the work is performed including processes of planning and scheduling;
- Administrative and technical data necessary for the performance of the activity;
- Information on how the plant divisions co-operate when performing work;
- Information on the documents and records necessary for the work performance, information on the records, necessary to be kept after completion of the work;
- References to the detailed working procedures.

Radioactive Waste Management Agency (RATA)

From 2007 RATA operates in compliance with the quality management standards ISO9001:2000 and ISO14001 and has been certified to these standards. All RATA procedures meet the VATESI quality requirements.

***Article 24: 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*

The basic radiation protection requirements, corresponding to IAEA requirements, are established in the Law on Nuclear Energy, the Law on the Management of Radioactive Waste, the Law on Radiation Protection and the Law on Environmental Protection. All operations with radiation sources are carried out in accordance with the basic principles of radiation protection, justification, optimisation and limitation.
The basic standards and safety requirements for occupational and public exposure during operations with sources of ionizing radiation and also in management of radioactive waste are established in the Lithuanian Hygiene Standard HN 73:2001 “Basic Standards of Radiation Protection”.
The limits for occupational and public exposure, established in HN 73:2001 are given in the table F-1 below:

**Table F-1: Limits for occupational and public exposure**

| **Application** | **Dose limits** | |
|---|---|---|
| | **Occupational** | **Public** |
| Effective dose | maximum annual 50 mSv, 100 mSv in a consecutive 5 year period | 1 mSv annual, in special circumstances - 5 mSv, provided that the average dose over 5 consecutive years does not exceed 1 mSv per year |
| Equivalent dose for: | | |
| The lens of eye | 150 mSv | 15 mSv |
| the skin, hands, forearms and feet and ankles, the skin | 500 mSv | 50 mSv |

HN 87:2002”Radiation Protection in Nuclear Facilities“ sets forth requirements for radiation protection of workers working at the nuclear facilities and for radiation protection of members of the general public during the operation and decommissioning of nuclear facilities. This standard establishes the dose constraint for the members of general public due to operation and decommissioning of nuclear facility, which is 0.2 mSv/year.
According to Lithuanian legislation 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 (ALARA principle). The implementation of the ALARA programme at the INPP started in 1996.

The ALARA Programme has the following basic directions at INPP:

Proper organisation of the activities.
- Personnel education and training.
- Improvement of working conditions.

- Perfection of engineering processes.
- Quality maintenance.
- Safety culture.
- Human element impact.

The ALARA foundations in INPP are applied and adapted in all operational stages related to radiation protection. Applying new principles of organising the activity and performance of scaled works to equipment upgrading did enable substantial reduction of the doses of Ignalina NPP personnel and outside workers.
The Lithuanian Hygiene Standard HN 87:2002 "Radiation Protection in Nuclear Power Facilities" sets out requirements for radiation protection of workers working at the nuclear facilities and for radiation protection of members of the general public during the operation and decommissioning of nuclear facilities.
In this standard the dose constraint for the members of public (critical group) due to operation and decommissioning of a nuclear facility (including radioactive waste storage and disposal facilities, spent nuclear fuel storage facilities) is set to 0.2 mSv/year for normal operation of the facility.
Table F-2 presents the data for occupational doses of INPP workers, involved in radioactive waste management (excluding spent nuclear fuel management).

**Table F-2: Data of occupational doses of INPP workers, involved in radioactive waste management (excluding spent nuclear fuel management)**

| The year | Collective dose, man mSv | Average individual dose, mSv | Maximum individual dose, mSv |
|---|---|---|---|
| 2005 | 28,95 | 1,26 | 3,91 |
| 2006 | 13,66 | 0,59 | 1,96 |
| 2007 | 9,64 | 0,39 | 2,15 |

Table F-3 presents the data for occupational doses (gamma and neutron) of INPP and outside workers, involved in spent fuel management.

**Table F-3: Data of occupational doses (gamma and neutron) of INPP and outside workers, involved in spent fuel management**

| The year | Collective dose, man mSv | Average individual dose, mSv | Maximum individual dose, mSv |
|---|---|---|---|
| 2005 | 8,83 | 0,17 | 1,15 |
| 2006 | 25,48 | 0,37 | 2,32 |
| 2007 | 7,81 | 0,15 | 1,10 |

The radiation protection requirements for radioactive waste management for small producers are set out in HN 89:2001 "Management of Radioactive Waste". In this Hygiene Standard the requirements for management of liquid, solid or gas radioactive waste and spent sealed sources are established.
Liquid radioactive waste management is carried out by one of the following:
discharge to the environment, if the activity levels do not exceed clearance levels, set in legislation;

1) the radioactive waste contaminated with short lived radionuclides (half live not more than 100 days) is reserved at temporary storage facilities until the activity will become less than clearance levels and is then discharged to the environment;

2) if the requirements of 1) or 2) are not satisfied, then liquid radioactive waste is solidified and disposed of in the radioactive waste storage facility.

Solid radioactive waste management is carried out by one of the following:

1) discharged as not radioactive, if the activity levels do not exceed clearance levels;
2) the solid radioactive waste polluted with short lived radionuclides (half live not more than 100 days) is reserved at temporary storage facilities until the activity will become less than clearance levels and is then discharged to the environment;
3) if the requirements of 1) or 2) are not satisfied, then solid radioactive waste is disposed of in the radioactive waste storage facility.

Radioactive waste in gaseous form, which contains aerosols, is discharged of by filtration. The gas form radioactive waste is discharged to the environment if activity levels do not exceed clearance levels, set in legislation.

The spent sealed sources are stored in the radioactive waste storage facility by Order, established in the Law on the Management of Radioactive Waste.

*iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.*

According to the laws (mentioned in Article 24;1), the standards of radionuclide discharges into the environment and the order of issuing of permits for radionuclide discharges as well as clearance levels of radionuclides, conditions of reuse of materials and disposal of waste are set by the Ministry of Environment.

The requirements for radioactive release limitation are set forth in the normative document LAND 42–2007 "Limitation of Discharges of Radionuclides from Nuclear Facilities, Permitting of Discharges and Radiological Monitoring" and the normative document LAND 41-2001 "Standards of Radioactive Discharges from Medical, Industrial, Agricultural and Research facilities; Permitting of Discharges".

The normative document LAND 34-2000 "Clearance Levels of Radionuclides, Conditions of Reuse of Materials and Disposal of Waste" establishes criteria when materials, equipment, installations, buildings and waste, contaminated with radionuclides or containing radionuclides may be used or disposed of without any application of requirements of radiation protection.

*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.*

The objective of the normative document LAND 42–2007 "Limitation of Discharges of Radionuclides from Nuclear Facilities, Permitting of Discharges and Radiological Monitoring" is to protect humans, other living organisms, natural resources (the land, forest, water) and other environmental entities from harmful impact of ionizing radiation and contamination by radionuclides from nuclear installations. The requirements of the document are applied to nuclear facilities during design, construction and operation as well as during decommissioning.

Only those substances may release radioactive particles into the environment (in liquid or gaseous form) for which permission has been received in advance. The Ministry of Environment issues this permission after studies of the plan of radioactive discharges as well as the programme of radiological monitoring. Limits of discharge are indicated in the permission. Radiological monitoring, consisting of monitoring radioactive discharges and environmental monitoring (in sanitary protective zone (3 km) and monitoring (30 km) zone), is carried out at INPP. Additional control within the zone of the nuclear facility is provided by the Environmental Protection Agency of the Ministry of Environment. Some data on atmospheric discharge from INPP and the dose for a critical group of members of the public, resulting from these discharges in 2005-2008 are given in the table F-6.

The new radioactive discharge permit for the period 2006-2010 was issued to INPP in December 2005. Discharge limits are indicated in the annex of the permit and shall be revised in the following cases:

- every 5 years after issuance of the permit;
- upon modification (including decommissioning and dismantling) of the facility;
- installation of a new nuclear facility in the vicinity of existing facility;
- when monitoring data show that limit values might be exceeded.

The INPP airborne and liquid discharge limits were established considering the requirements of the Normative Document LAND 42 – 2007 "Limitation of Discharges of Radionuclides from Nuclear Facilities, Permitting of Discharges and Radiological Monitoring". Authorized discharge limits and data on airborne and liquid discharge into the environment from INPP are provided in the tables F-4 - F-6 below.

**Table F-4: Discharge limits of INPP**

| | Discharge limits, Bq/year |
|---|---|
| Airborne discharges | $1,41 \cdot 10^{16}$ (including: noble radioactive gases – $1,39 \cdot 10^{16}$; radioactive aerosols – $9,4 \cdot 10^{11}$; Iodine-131 – $9,87 \cdot 10^{11}$) |
| Liquid discharges | $8,811 \cdot 10^{12}$ |

**Table F-5: Discharges of radionuclides into the Drūkšiai Lake during 2004-2007**

| Year | Discharges, Bq |
|---|---|
| 2005 | $3,24 \cdot 10^{12}$ |
| 2006 | $5,76 \cdot 10^{11}$ |
| 2007 | $6,48 \cdot 10^{11}$ |

**Table F-6: Data on atmospheric discharges from INPP**

| Years | Radioactive noble gas, TBq | | Radioactive aerosols, GBq | | $^{131}$I, GBq | | Annual dose to the critical group |
|---|---|---|---|---|---|---|---|
| | Activity | % of DL* | Activity | % of DL | Activity | % of DL | μSv |
| 2005 | 74.40 | 0.54 | 0.5865 | 0.06 | 6.670 | 0.68 | 1.128 |
| 2006 | 31.20 | 0.22 | 0.6915 | 0.07 | 7.70 | 0.78 | 1.388 |
| 2007 | 77.60 | 0.56 | 0.7822 | 0.08 | 8.49 | 0.86 | 1.369 |

*DL – Discharge Limit

No exceeding of limits in discharges was recorded.

The annual dose for critical group of the public during normal operation of INPP did not exceed dose constraint value (0,2 mSv):

- in 2005 (one unit was operated) – $1,13 \cdot 10^{-3}$ mSv and $9,59 \cdot 10^{-4}$ mSv due to the airborne and liquid discharges respectively, in total $2,09 \cdot 10^{-3}$ mSv per year;

- in 2006 (one unit was operated) – $1{,}39 \cdot 10^{-3}$ mSv and $1{,}47 \cdot 10^{-4}$ mSv due to the airborne and liquid discharges respectively, in total $1{,}54 \cdot 10^{-4}$ mSv per year.

In 2007 - 1,369 x $10^{-3}$ mSv and 1,940 x $10^{-3}$ mSv due to the airborne and liquid discharges respectively, in total. 3,309 x $10^{-3}$ mSv per year.

The normative document LAND 41-2001 "Standards of Radioactive Discharges from Medical, Industrial, Agricultural and Research facilities; Permitting of Discharges" sets forth main requirements, when planning for control of the discharge into the environment of materials containing radionuclides, resulting from the use of radionuclides in medicine, industry, agriculture and research.

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

If discharge limits are exceeded or if unauthorised radionuclides are discharged, the subject facility or institution shall analyze the causes, circumstances and consequences of increased discharges and take measures to eliminate these causes and ensure recurrence. The facility or institution shall inform the Ministry of Environment, the Environmental Protection agency, RPC, VATESI, the Ministry of Economy and local municipalities about the causes of the increased release, measures taken and subsequent preventive actions (now or in the future). The facility or institution is bounded by the Ministry of Environment to eliminate the cause of violation of the discharge permit. Validity of the permit must be revoked if it is not eliminated within the requested time period. In this case the Ministry of Environment shall inform the permit holder, RPC and VATESI about revocation of the permit and submit a proposal to VATESI concerning license suspension or revocation.

### *Article 25: 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.*

In the Republic of Lithuania the main infrastructure and functional requirements for emergency preparedness and countermeasures, are legalised.

The Civil Protection Law defines how the civil protection and rescue system shall be organised in Lithuania, it provides the basis for legislative and organisational matters and describes responsibilities that rest with the state, the municipal authorities and facilities or institutions.

The Law on Nuclear Energy defines allocation of functions for responsible institutions in the field of nuclear accident prevention and management of accidents and their consequences.

The Law on Radiation Protection establishes the legal basis for radiation protection in order to protect people and the environment from harmful effects of ionizing radiation and defines the state management system of radiation protection.

The Law on the Management of Radioactive Waste regulates the interfaces between legal entities and individuals in management of radioactive waste; it also establishes the legal grounds for management of radioactive waste. According to this law, the operating organisation of the radioactive waste management facility is responsible for establishing plans for emergency response in case of incidents, or accidents before start of operation or commissioning, as well as plans to eliminate the consequences.

Order No. 371 of the Minister of Defense, dated 11 April 2000, approves the National Emergency Response Plan in the Event of Radiation Accident at INPP. This national document describes in detail the functions, responsibilities, interactions and communications of the state and municipal institutions, which are responding to a radiation accident.

Following the provisions of the Convention on Early Notification of Nuclear Accident (1986) and implementing the Council Decision 87/600/EURATOM and 89/600/EURATOM, the Government Resolution No. 559 „On Approval of Order of Public Information In Case of Radiological or Nuclear Accident" was approved in 2002.

Taking into account the provisions of the IAEA Safety Series No. 115, No. 120, the Council directives 96/29/Euratom and 97/43/Euratom, the Hygiene Standard HN 73:2001 „Basic Standards of Radiation Protection" sets forth the intervention and action levels and the dose levels at which intervention is required under any circumstances. It also sets forth the obligation for licensees to apply these intervention levels and the requirement to establish emergency preparedness plans, etc.

Operational intervention levels, organisation of iodine prophylaxis, control of drinking water, dosimetric control of the general public, decontamination and other procedures are established in the HN 99:2000 „Protective Actions of Public in Case of Radiological or Nuclear Accident". This hygiene standard was prepared taking into account the provisions of the IAEA SS No. 109, 55 and other documents.

The Regulations on Dosimetric Control in Case of Nuclear or Radiological Accident set forth the requirements for dosimetric control of personnel involved in accident response, vehicles, equipment, goods and other objects used in the hotspot of a radiological or nuclear accident. The Regulations legalise dosimetric control methods in use to avoid unjustified high exposure to accident response personnel, establish how long they are allowed to work in the territory of high exposure, etc. The regulations take into account provisions of the IAEA TECDOC-1162 "Generic procedures for assessment and response during a radiological emergency".

The applicant for a license to operate activities with sources of ionizing radiation or manage radioactive waste submits the plan for accident prevention and elimination of its consequences and other documents. The actions and measures that will be taken in case of a radiation accident are foreseen in the plan. State supervision ensures adequate control of nuclear safety, radiation protection, control of operations, emergency preparedness plans and their renewal. It is also controlled, how the emergency preparedness plans are tested in practice (conducting exercises in this field).

INPP developed an emergency preparedness plan Emergency preparedness in all aspects of INPP activities, including spent fuel and radioactive waste handling systems, is performed in accordance with this plan. It is the main management directive for implementation of all organisational, technical, medical and other protective measures to protect the public, plant personnel and the environment from the consequences of accidents or incidents. The objective of the plan is to provide a sequence of emergency planning arrangements at INPP to achieve the appropriate level of preparedness for the plant personnel, the public administration institutions and actions in case of an accident at INPP.

An Emergency Preparedness Plan for the Maišiagala storage facility (the description of the storage facility is provided in Article 12) was developed and approved in 2005. The plan foresees actions of RATA personnel in case of emergency. The Emergency Preparedness Plan foresees two stages of events: a local emergency and a radiological accident.

Those plans shall be reviewed every 3 years or after significant changes in operation procedures.

According to Government Resolution No. 205 - On Republic of the Lithuania Government

Resolution No. 653 “On Regulations of Licensing the Practices Involving Sources of Ionizing Radiation” modification (adopted on 23 February 2004) - the legal entity (small radioactive waste producer) applying for a license to produce, operate, store, maintain, repair, recycle sources, and manage (collect, sort, treat, keep, recycle, store and decontaminate) radioactive waste, shall submit among other documents, an emergency preparedness plan and a plan for management of radioactive waste.
Hospitals are checked annually for their preparedness to take and render medical aid for injured people during radiological and nuclear accidents. Also workshops and training courses are organised for the specialists in public and private health care. Training is conducted in adequate practices in case of an accident in order to provide help to injured persons.
Since February 2008 the Fire and Rescue Department works on development of a new version of the National emergency response plan in the event of a radiological accident at INPP. The activities reflect the current position of Government (order of the Chancellor of the Government in February 2008).

*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.*

The Government Resolution No. 111 of 1 February 2000 approved the Order of Exercises and Training in Civil Protection. To implement the requirements of this resolution, national training courses and exercises in emergency response are organized for all staff of state and municipal institutions, which is involved in emergency response. During the recent 5 years, many workshops, drills and exercises in emergency response were organized nationally, regionally and internationally, including preparation of plans, training, dosimetric control and decontamination, as well as the international co-operation and communication between countries in case of such accident.
Following the aforementioned Resolution procedures all licensees are required to conduct drills and exercises as foreseen in their procedures.
The Director General of INPP as the manager of the Emergency Preparedness Organisation, and the Technical Director as the manager of plant operations, once per three years have to pass training tests in the Training Center of Civil Defense Department of the Ministry of Defense.
The Director General conducts:

- Annual training of a defined group of management staff according to the 6-hour program;
- Exercises with managers involved in emergency preparedness, at least once per year;
- Integrated exercises at least once every three years.

The Head of Civil Defense and Emergency Situations at INPP conducts annual training of a defined group of management according to the 6-hour program.
Every year the Director General conducts exercises with managers involved in emergency preparedness.
Once every three years the Emergency Preparedness Organisation personnel (defined group of personnel) takes part in integrated exercises, where the level of the personnel emergency preparedness and its ability to work in complex situations while meeting the stated objectives are checked. Such exercises also are used as a basis for a general national exercise of all state and municipal authorities.
The main regulatory authorities, such as VATESI, RPC, have established its own emergency training and exercising programs.
Experience is gained and knowledge is renewed in management of radiation accidents. The experience gained is shared with workers from other institutions that are in charge for rapid response in case of radiation accidents. Joint training and exercises are also organised.

***Article 26: 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;*

In order to plan and implement the decommissioning activities, the Decommissioning Service was founded at INPP in 2000. By the end of 2007, 112 people (including the staff of the Technical Archive) are employed. The Service is staffed by INPP personnel, who have been previously involved in operation and maintenance of the plant. In addition, the Consultancy Support (the Consortium) to INPP Decommissioning Service for Ignalina International Decommissioning Support Fund projects is provided since 2001. The Consortium shares its own experience with the Decommissioning Service staff and assists in engineering, planning of decommissioning and project management.
The financing system and funds of decommissioning are described in Article 22 of the Report.

*(ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;*

The basic requirements for spent fuel and radioactive waste facilities operations and decommissioning are set forth in the Law on Nuclear Energy.
Detail requirements for INPP decommissioning are set out by VATESI in General Requirements for INPP Decommissioning. According to this document, before decommissioning is started, the Final Decommissioning plan should be prepared and approved by the relevant authorities. The final Decommissioning Plan of INPP was approved in July 2005.
The radiation protection requirements for decommissioning of nuclear facilities are set forth in HN 87:2002 “Radiation Protection in Nuclear Facilities“.
Before decommissioning of the nuclear facility, the radiation protection programme is established. It shall be presented to the regulatory authorities with the Final Decommissioning Plan. During the planning of appropriate radiation protection measures and implementation of the radiation protection programme, the licensee:

- foresees and applies the optimization and dose limitation principles;
- estimates labour expenditures, collective and individual doses for each decommissioning phase and seeks RPC approval;
- estimates the committed effective dose for the general public for each decommissioning phase of the nuclear facility;
- performs the individual monitoring of workers and monitoring of workplaces, analyses obtained results and presents them to the RPC according to order established by legal acts;
- where appropriate describes which and how the methods for decontamination of equipment and components of the nuclear facility are applied;
- estimates the radiation environment at the beginning and at the end of each decommissioning phase of the nuclear facility;
- estimates the amount of radioactive waste resulting during the decommissioning of the nuclear facility and estimates the exposure of workers handling the radioactive waste;
- estimates planned amounts of radioactive materials released to the environment, controls the releases and ensures not to exceed the release limits, established by legal acts;
- ensures in accordance with provisions established in LAND - 34, that conditional and unconditional clearance levels are applied for the radioactive substances that are transported from the nuclear facility or that will be reused.

The Order of the Minister of Health No. V-712 on "Regulations of Decommissioning of the Objects in which Practices Involving Sources of Ionizing Radiation Were Executed (2003)", establishes requirements for decommissioning of non-nuclear facilities (hospitals, radiographers, research laboratories etc.). The applicability of the documents covers all small users, except of decommissioning of x-ray generators and practices with sources of risk categories IV and V. Records concerning decommissioning shall be kept 75 years. The Regulations require preparation of the Final Decommissioning Plan (Annex 2 of Regulations) in advance, which also contains safety measures, in case of an accident.
In decommissioning the radioactive contamination of premises, equipment, territory of the facility and surface contamination of all items is evaluated. Contamination levels must not exceed legislatory clearance levels. If there is possibility of radioactive waste contamination, the decontamination of the contaminated premises, facilities and territory is provided until clearance levels are achieved.
If due to increased contamination it is not reasonably to perform repeated decontamination, then contaminated materials and equipment are managed as radioactive waste. The dose constraint for the members of public due to decommissioning of nuclear facilities is set 0.2 mSv/year.
After finalisation of the decomisioning the Licensee must provide the Final Decomisionig Report. After evaluation of this report the license can be withdrawn.

*(iii) the provisions of Article 25 with respect to emergency preparedness are applied; and*

On-site and off-site emergency preparedness during decommissioning will remain the same as during operations. The appropriate emergency preparedness arrangements are described in Article 25 of the Report.

*(iv) records of information important to decommissioning are kept;*

A specific project aiming at providing a new archive system at INPP was launched in 2003. This system is now completed and will ensure safe long term storage of the information needed for (and produced by) the decommissioning.

Decommissioning is a continuous activity covering numerous processes related to preparation, decontamination, dismantling and disposal of equipment, buildings and components thereof. The purpose of the Decommissioning Management System & Database (DMSD) is therefore to establish a ready-to-use system (hardware and software) addressing the effective management of these processes, linking all the aspects of the decommissioning management process including waste management, human resources planning, project management, material costs and documentation through a single unified interface. The delivery of DMDS is expected by November 2008 and will be ready for use in 2009.

## SECTION G. SAFETY OF SPENT FUEL MANAGEMENT

***Article 4: 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 so doing, 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;*

All spent nuclear fuel in Lithuania is located in INPP's storage pools, or in the dry interim storage facility. In both cases the spent fuel is handled according to the design documentation, adopted by the regulatory body and both methods are licensed (with involvement from experts from Western Europe), thereby providing a justification for safety. It is shown, that the safety criteria, particularly criticality and sufficiency of removal of residual heat, are fulfilled during normal operation and during design basis accidents.

*(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;*

In order to minimise the amount of spent fuel measures are taken to increase the nuclear fuel burn-up, to implement the fuel assemblies with uranium - erbium and to avoid leaking fuel assemblies. Due to the decision to terminate operation of the first Unit of Ignalina NPP, the project of burn-up of spent fuel from Unit 1 in the reactor of Unit 2 was started and being implemented.

*(iii) take into account interdependencies among the different steps in spent fuel management;*

The technical process of the management of spent fuel is developed to simplify operations of transportation and minimise the number thereof and also to cope with interdependencies in the different steps in spent fuel management. After one year storage the fuel assemblies are kept in special basket, which are compatible with containers for interim dry storage. The containers are suitable for storage and transportation. In the future, in case of a decision to change the technology used, it will be not be difficult to remove the casks or separate the assemblies.

*(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;*

Protection of individuals, the society and the environment from the effects of ionizing radiation is a requirement of the radiation and environmental protection legislation, where the system of radiation protection, consisting of justification, optimization and dose limitation is prescribed. The applicable dose limit for members of the public of 1mSv effective dose per year and the dose limit for workers of 20mSv per year are implemented. Compliance of spent fuel management facilities with the legislation is ensured from the licensing through to the operational phase. At each licensing step a SAR demonstrating compliance has to be submitted and reviewed by regulatory body.

*(v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;*

Biological, chemical and other hazards are subject to the environmental and radiation protection legislation, which aims at human health protection. Hazards other than radiation encountered by workers during handling of spent fuel are covered by general legislation on safety in the workplace.

*(vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;*

In Lithuania there are several legal requirements which aim to avoid impacts on future generations. The principle is formulated that the risk to humans and the environment shall at no time in the future exceed the levels permissible in Lithuania today.

*(vii) aim to avoid imposing undue burdens on future generations.*

There are currently no disposal facilities for spent fuel in operation or under construction in Lithuania, but our legal requirements explicitly formulate as one of the overall objectives of disposal, that no undue burdens are to be imposed on future generations. It is required to prove in the SAR that safety of radioactive waste management facilities will be ensured through to closure of the facility.

***Article 5: Existing facilities***

*Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel 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.*

The aim of the SAR is to ensure that a spent fuel management facility will be constructed and operated safely, i.e. that it will satisfy the requirements of the laws and regulatory documents of the Republic of Lithuania. This will be achieved by approval of the concerned authorities that the proposed storage facility and its components have been properly technically evaluated.
The following shall be analysed and presented in the SAR:

- The essential assumptions forming the basis for the proposed storage project, paying special attention to the amount and characteristics of the spent fuel;
- The foreseen conditions under which a storage facility may be operated and the risk factors potentially affecting the storage facility;
- A documentation of the typical storage operational limits, such as the KEF factor, the maximum fuel element temperature, and the ionizing radiation levels inside the storage facility and outside its boundaries.

The SAR shall be of such extent and content that it fully describes the following:
1. The storage buildings, systems and elements, which description shall:

- identify the purpose of the whole storage, its buildings, systems, elements and outfits being used;

- investigate and properly substantiate those project circumstances which could affect the safety.

2. The applicable operational limits shall:
   - reflect the main safety related technical aspects;
   - be co-ordinated with VATESI and other state or state delegated authorities and/or the supervising institutions.

3. The design process of the storage facility, which description shall be detailed enough so that:
   - the design methods and factors, which have been taken into consideration, are properly presented and documented;
   - the SAR proves that the design of the storage facility has been completed, reviewed and approved by the appropriate authorities, and that the project has been divided into parts which are properly investigated and described, and that all significant factors have been properly accounted for, are evaluated and accepted;
   - it is clear that the proper technical investigations have been applied, both for the individuals in the storage facility, as well as the storage facility itself, and that the complete analyses and calculations have been successfully performed, and are reviewed and approved by the appropriate authorities.

4. The engineering aspects of the storage facility shall include the following:
   - the spent nuclear fuel shall be fully characterised by giving its physical, chemical, radiological and engineering properties, its enrichment level, history of burn-up, and the specifications for the storing of the radiation exposed fuel in the pools. It is necessary to describe the expected alterations in the fuel characteristics during the lifetime of the fuel. Before fuel may be placed into a storage facility, it is also necessary to indicate the minimum duration of fuel storage in the pools;
   - the safe operational conditions prove that sufficient number of reliable elements and systems have been designed and that those systems are of different construction, or if they are alike, that their number is sufficient so that in case of failure of one element or system, sufficient redundancy ensures appropriate functioning of storage facility,
   - it should be clear for an expert who evaluates the SAR that functioning and conformity of all elements have been ensured, and the elements will supplement each other ensuring functioning of the system as a whole;
   - it should be indicated how the principle of “the deep down protection” has been realised;
   - it should be demonstrated that the project is technically reliable and can be realised with the available technologies upon fulfillment of well-grounded acceptable improvements.

5. The storage administration aspects (procedures, controls, monitoring, etc.)
6. The storage operational parameters.
7. The anticipated storage operational conditions, including description of the supporting methods used for the determination of these conditions, recognising the following:
   - it is necessary to describe the impact of the outside conditions (site conditions, processes, events, nature and human influences) to the storage facility, evaluation of such impact and expected alterations in the course of time. It is also necessary to indicate to which extent of impact the storage facility has been designed;
   - the integrity of the storage facility elements during normal operation as well as accidents shall be determined with supporting structural analysis methods. This structural analysis shall evaluate the future structural loads and alterations of substance properties in the course of time;
   - it is necessary to evaluate the size and the nature of the impact of the storage facility (radiological impact: radiation exposure, release, doses, and if needed, the non-

radiological impact as well) upon the environment and people and to compare it with the operational criteria. The circumstances and alteration subsequent to the impact shall be described and evaluated in the course of time, including the expected changes of the number of the surrounding population;

- the completed analysis and the documented evidence shall be clear and exact, i.e. it shall be completely clear which models have been used, what parameters have been chosen, and what limiting conditions and assumptions have been applied. The reasons why exactly those methods, parameters, limiting conditions or assumptions have been chosen shall be also documented;
- it shall be evident that the chosen models are proper, that they are related to the concerned problem, that they properly reflect the concerned processes, and that they have been integrated into a fluent and consistent systematic model;
- the circumstances and methods used during validation, verification and sensitivity analysis shall be documented;
- the evaluations and calculations shall be presented in such way that an expert analysing the SAR would have the possibility to draw a conclusion that they have been properly performed and completed;
- it should be clearly demonstrated that the whole design process, including data collection, evaluation and project preparation, has been carried out in accordance with quality assurance procedures, and that a proper general quality assurance program will be prepared during project realisation and storage operation; it should be ensured that the quality assurance program applied while carrying out the analysis and preparing the SAR be clearly described and documented.

***Article 6: Siting of proposed facilities***

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

*(i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;*

A new Spent Nuclear Fuel Storage Facility (SNFSF) will be constructed at the territory of INPP's control area, within the framework of the INPP Decommissioning Programme,
According to the procedure of the site selection, all necessary steps were performed:

- Assessment of all possible factors of the impact of the chosen site on the storage safety over its life time;
- Assessment of possible impact of the storage on personnel, the public and the environment.

These aspects and evaluation of relevant site-related safety factors during SNFSF operation are considered in the EIA report of the planned economic activity.
Aforementioned activities were performed in compliance with appropriate standards of the Republic of Lithuania, which meet all international requirements and recommendations (see Article 4 "General requirements of safety").
A decision regarding feasibility to construct an SNFSF at the territory of INPP considering its environmental impacts was adopted by the Ministry of Environment of Lithuania on 30 November 2007.

*(ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;*

Evaluation of the safety impact of a new SNFSF on individuals, the society and the environment was performed within the framework of establishing the EIA report.

The EIA report includes exhaustive examination of all issues provided in the EIA program, an analysis of the alternatives, a plan for environmental monitoring, information about the problems encountered, as well as an executive summary of all information considered in the report.
The EIA is carried out according to the requirements of the following legal acts:

- Law on Environmental Impact Assessment of the Republic of Lithuania (1996, last amended in 2008, Official Journal No. 81-3167);
- Governmental Resolution No. 900 "On Empowering the Ministry of Environment and the Subordinate Institutions" (2000, last amended in 2003, Official Journal No. 14– 582);
- Order of the Minister of Environment No. D1-636 "On Approval of Regulations on Preparation of the Environmental Impact Assessment Program and Report" (2000, last amended in 2008, Official Journal No. 79 – 3138);
- Order of the Minister of Environment No. D1-370 "On Informing the Public and Public Participation in the Process of Environmental Impact Assessment" (2000, revised 2005, Official Journal No. 93 – 3472);
- Order of the Minister of Environment No. 305 "On Approval of Guidelines on the Quality Control of Environmental Impact Assessment of a Proposed Economic Activity" (2000, Official Journal No. 65 – 1971);
- Order of the Minister of Environment No.333 "On Investigating the Environmental Impact Assessment Documents at the Ministry of the Environment and Subordinate Institutions " (2000, revised 2006 No. 75 – 2882).

Provisions of the European Parliament and the Council Directive 2003/35/EC, 26 May 2003, requiring public participation in respect of the drawing up certain plans and programmes relating to the environmental and amendments with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC, were transferred into national EIA legislation.

The EIA procedure and requirements for documentation comply with the following international conventions:

- Convention on Environment Impact Assessment in a Transboundary Context, Espoo, 25th February 1991;
- Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters, 25th June 1998.

A contracted consortium developed the EIA programme previous to the preparation of the EIA Report for the SNFSF. The programme defines the content of the EIA Report including an outline of the main alternatives for site selection and an indication of the reasons for their choice. The EIA Program of SNFSF was approved by Letter No. (1-15)-D8-9433 of the Ministry of Enviroment dated December 7, 2005.

The final version of the SNFSF EIA Report was issued considering comments and recommendations of the experts of the state Institutions of Lithuanian, Latvia and Belarus.

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

According to the requirements of the Law on the Environmental Impact Assessment of Planned Economic Activity (State News. 2005 Nr. 84-3105) and the Order on Informing the Public and the Public Participation in the Process of Environment Impact Assessment (State News. 2005 Nr. 93-3472), the SNFSF EIA Report has been presented for public review.

The general public was informed about the initiated EIA via Lithuanian media (newspapers "Lietuvos rytas" 2005-06-10, "Nauja vaga" 2005-06-11, "Sugardas" 2005-06-09 and "Zarasų kraštas" 2005-06-10).
The report on the SNFSF EIA was presented to the public and for public debate and was announced in the following Lithuanian newspapers: "Lietuvos rytas" 2007-01-06, "Nauja vaga" 2007-01-06, "Sugardas" 2007-01-11 and "Zarasų kraštas" 2007-01-09.
The public debate of the report for the SNFSF EIA took place in the INPP Decommissioning Service on 2007-01-26. Before and after the public debate no proposals regarding the content of the report on SNFSF EIA were received.

*(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.*

According to the requirements of the Espoo Convention (State News 1999, No. 92-2688), the Ministry of Environment of the Republic of Lithuania notified respective Institutions of the Republics Latvia and Belarus about the proposed economic activity related with the SNFSF construction and operation and presented the EIA program. Both countries decided to participate in the transboundary EIA procedure and commented on EIA program.

The EIA report was also submitted to Latvia and Belarus. Upon request of the neighboring countries, meetings with the general public of these countries regarding the EIA of the SNFSF have been organized (May 13, 2007 in Daugavpils, Latvia and April 19, 2007 in Vidzy, Belarus). During the meetings, the proposed economic activity was presented, the public participants were familiarised with the SNFSF EIA Report of the proposed economic activity and the concerns raised were answered. The comments of Institutions and the public of the Republics Belarus and Latvia to the EIA Report are presented in the Ministry of Environment letter No. (1-15)-D8-2987 from April 3, 2007.

Experts of interested Lithuanian institutions, representatives of INPP, NUKEM and the Lithuanian Energy Institute discussed the submitted comments from the countries during international consultation meetings in Vilnius with representatives of interested state institutions of Belarus (September 5, 2005) and Latvia (September 7, 2007).

The answers to the comments of the Republic of Belarus and the Republic of Latvia for the EIA Report are attached to the final SNFSF EIA Report.
In addition, the Government Resolution No. 1872 adopted on 6 December 2002 (based on requirements of Article 37 of the EURATOM Treaty) requires to provide the European Commission with the general data relating to any plan for the disposal of radioactive waste in whatever form to enable determination whether implementation of such plans could result in radioactive contamination of water, soil and air of another member State.
In accordance with the aforementioned requirement, INPP has prepared the List of Data for the activity related to the removal of radioactive waste in the SNFSF as required by the European Commission.

At present the List of Data is under consideration in the VATESI and other Lithuanian authority.

*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.*

The nearest foreign countries from INPP are the Republics of Latvia and Belarus. As it was mentioned above, they were informed about plans to build and operate SNFSF and they were provided with the EIA documentation had the opportunity to comment to it.

***Article 7: Design and construction of facilities***

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

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

According to the rules existing at the time of the former Soviet Union, the wet SF storage facility was designed as a part of the Unit end 70ies, beginning 80ies. Within the last ten years, a number of measures which improved safety of the SF storage to the level required by modern standards of the Lithuanian Republic, were implemented. The required safety level has been upgraded to fall within the limits of the SAR of INPP Units 1 and 2 as confirmed by the SAR for "wet" storage.

The existing dry SF storage facility was designed at the end of the 90ies and it meets all safety requirements. Design of the existing dry SF storage facility also contains a SAR which confirms that the radiological influence of storage on personnel, public and environment is limited toding the prescribed limits (see Article 4).

The Technical Design and the Preliminary SAR for new Interim SNFSF were prepared by the Consortium. Currently the Technical Design and the Preliminary SAR are under review by the state Institutions of Lithuania.

*(ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;*

The Technical Design and the Preliminary SAR of the new SNFSF provide information relating to the storage and decommissioning after removal of all of the spent fuel to a final repository. The Technical Design and the Preliminary SAR present a preliminary program of decommissioning of a storage facility and measures enabling easier decontamination of the systems and devices, minimising the amount of radioactive waste and contaminated devices to the lowest possible level and supporting elimination of the radioactive waste and contaminated substances during final decommissioning of the SNFSF.

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

In accordance with the Technical Specification, the technologies incorporated in the design and construction of a new SNFSF are supported by experience, tests and analyses from the company GNS (Germany) that has experience in commissioning of the existing INPP SF storage technology.  The new proposed technologies will be tested before obtaining an operational license for new SNFSF.

***Article 8: 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;*

Since it was not required to perform safety analysis at the moment of design of the INPP units, the assessment of wet storage facility safety was executed within the framework of the INPP Unit 1 license. The SAR was developed in 1999, was reviewed by a group of international experts and was adopted by VATESI as the basic document for licensing.
Assessment of the safety of the existing dry SF storage facility was performed during the design process and was reviewed and approved in a coordinated affort as required by the Lithuanian legislation and standard acts.
The Preliminary SAR of the new Interim Spent Fuel Storage Facility has been prepared by the consortium in accordance with standards applicable for the Lithuanian Republic.

Content of the SNFSF Preliminary SAR corresponds with the content as recommended in IAEA document "Safety Assessment for Spent Fuel Storage Facilities" Safety series No. 118, the Lithuanian document "The General Requirements for Dry Type Storage for Spent Nuclear Fuel", VD-B-03-99 and was approved by VATESI.

The general content of the Preliminary SAR of the SNFSF includes:

- introduction;
- design description;
- natural site characteristics;
- human activity in the region of the site;
- design basis;
- the design justification;
- fuel management system;
- monitoring;
- inspection and maintenance programme;
- conceptual plan for decommissioning of facility;
- Quality Assurance programme.

At present the SNFSF Preliminary SAR is under review by Lithuanian authorities.

As it was mentioned above the final version of SNFSF EIA Report was issued considering comments of the experts of the State Institutions of Lithuania, Latvia and Belarus. On the basis of the results of SNFSF EIA Report the Ministry of Environment of Lithuania on 30th November 2007 made the decision documented as No. (1-15)-D-8-10101 concluding that construction of a new SNFSF is acceptable.

*(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).*

Before start of operation of the new SNFSF the Final SAR will be prepared. It will be based on the Preliminary SAR based on construction and in accordance with the results of pre-commissioning, commissioning testing ("Cold trial" and "Hot trial" testing) and comments from Lithuanian authorities.

***Article 9: Operation of facilities***

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

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

The wet SF storage facilities (storage pools near the reactor) are in operation from the date INPP Power Unit 1 was commissioned in December 1983. At that time it was not required to obtain a license for operation of the SF storage facility. Permission to operate was granted by the State Commission after reviewing all the procedures required to confirm safe operation, prior to commissioning. Also, all systems were tested prior to commissioning i.e. all characteristics of the systems to prove safe functioning. All such checks and tests were performed in accordance with special procedures co-ordinated by regulatory bodies responsible for safe operation of INPP. Licenses to operate the wet storage facilities at Units 1 and 2 were granted together with the licenses for operation of these Units in 1999 and 2004 respectively.

Permission for operation of the dry spent fuel storage facility was also granted by the State Commission, upon successful "Cold trial" and "Hot trial" tests and after review of the appropriate documents and procedures necessary for commissioning. All systems and the proper and safe functioning thereof were tested in the same way as for the wet SF storage facility. Upon successful testing the license for operation of the dry storage facility was granted in 2000. This license was updated in 2006.

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

The storage limits for SF in the interim spent fuel storage facility are described in the conditions of the license - 20 CASTOR and 78 CONSTOR casks. Currently, the modification to enlarge the existing spent fuel storage facility by 14 CONSTOR RBMK casks is being implemented.

The conditions of the SF are described in the license as follows:

- enrichment of isotope of uranium U 235 shall be no more than 2%;
- burn-up shall be no more than 20 MWd / kg of uranium;
- the criteria for compacting spent fuel assemblies is set such that the increase of activity of Cs 137 in the water of container shall not exceed $5\times10^{-6}$;
- the minimum time for storage in the pools 5 years.

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

The operation, maintenance, surveillance, inspection and testing of the wet storage facility (SF storage pools) are performed in accordance with the procedures, that are part of the design documentation. During the period of operation of the storage pools there were no safety related incidents.
The operation of the existing dry SF storage facility started in 2000 when the license was received.
Operation, maintenance, surveillance, inspection and test of the dry storage facility are performed in accordance with approved procedures.

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

Within the INPP Engineering Support Department a group for handling spent nuclear fuel and radioactive waste was established in 1995 in order to provide engineering and technical support in the field of spent nuclear fuel handling. The group provides constant engineering support to the operation of the SF handling systems and is responsible for modification of the SF handling equipment and systems and the implementation of new projects.

Additionally, in the beginning of 1993, a Safety Improvement Programme was implemented at INPP. This Programme covers the following issues for SF handling:

- the design, construction and commissioning of the dry storage facility for SF with CASTOR and CONSTOR casks;
- implementation of the capacity increase of the SF dry storage facility to 98 casks also ensuring the procurement of additional casks;
- equipping the hot chambers of the Units 1 and 2 with the system for SF spill collection and removal.

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

INPP procedures concerning reporting are developed in accordance with General Requirements of VATESI the "System of Unusual Events Report at Nuclear Power Plants", VD-E-04-98 and recommendations from IAEA were taken into account.
INPP managers, the VATESI inspector on duty and the local authorities of neighboring communities are informed by the Plant Shift Supervisor about events at INPP in accordance with the requirements of the "Instruction on Unusual Events Report".
Written reports about events will be prepared and send to VATESI and co-operating organisations by the Safety Surveillance Department in accordance with the Instruction on Unusual Events Report at INPP. Written reports on events evaluated as level 2 or higher according to the INES scale, shall be sent to IAEA according to this procedure.
Written reports to the media, the public and local authorities are prepared and sent by the INPP Information Center in accordance with the Procedure ("Instruction on Preparation and Transformation of Informational Reports on Operation and Unusual Events at INPP to Mass Media, Local Authorities, Ministries and Departments").
In case of accidents at INPP the information is transferred by the Emergency Preparedness Organisation as required by the Management Procedure QA-2-015, "Emergency preparedness".

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

Analysis and recording of INPP operational experience are performed in accordance with Management Procedure QA-2-003, “Evaluation of its own and industrial experience at INPP” and with related working procedures.
Events used for the analysis are selected in accordance with the criteria as established in the Procedure “Instruction on unusual events analysis”.
In accordance with this Procedure the Plant Shift Supervisor provides the preliminary information necessary for the analysis, prepares the shift report on the event and subsequently sends it to the Event Analysis Commission.

Event analysis is performed according to the ASSET methodology, by officially appointed commissions. The commissions perform a root cause analysis of the events, define corrective measures and prepare the report. The Manual for the International Scale of Nuclear Events INES Users of the IAEA, is used to evaluate the event impact on safety.
Reports of the events are distributed within the plant and externally, according to distribution criteria. The report distribution criteria are based on the importance for safety.
The Document Control Department ensures the registration, distribution of the prepared reports within the plant, filing and control of the corrective measures in accordance with Management Procedure QA-2-002, “Management of documents and records”.
The Safety Surveillance Department takes care of the distribution of external reports. Reports on events distributed externally undergo an independent review by the Quality Assurance Department in accordance with the Procedures “Instruction on unusual events analysis” and “Instruction on performance of periodical review of events at INPP”.
Event reports are filed in the computerised archive system and information system for unusual events, which enables the possibility of a quick search for required information.

The Safety Surveillance Department keeps a list of annual events that took place during the past year and which were selected for the analysis.
The Safety Surveillance Department performs a trend analysis and evaluation of causes of these events and informs the Safety Committee and the INPP Information Center as required by the Procedure and Instruction for the performance of periodic review of events at INPP.
Once a month the Safety Surveillance Department issues a report on review of events, that took place during this period in accordance with the Instruction for the performance of periodic review of events at INPP. Reports are sent to the plant managers, INPP departments and services and to the On-Site Division of VATESI.
Every month, the Safety Surveillance Department forwards the list of events that took place during the past month to VATESI. The list of events for each calendar year and the results of the analysis of all these events are included in the Annual Report on INPP safety.

*Programme of own and industrial experience evaluation*

Evaluation and usage of operational experience are performed according to the Procedure "Instruction on Evaluation and Use of its Own and Industrial Experience".

All information on its own, as well as the industrial experience is forwarded to the Document Control Department, which performs registration, reproduction and distribution of the documents, as well as feedback on the use of the operational experience.
A responsible co-ordinator for the usage of its own, as well as the industrial experience is appointed within each division.
These divisional co-ordinators issue proposals on improvement as required by the Procedures "Instruction on Evaluation and Use of its Own and Industrial Experience" and "Instruction on the Work with INPP Employees Proposals", which will be submitted for approval to the division managers, where after they are forwarded to the Document Control Department Co-ordinator.
Corrective measures and change proposals for the procedures and equipment are issued in accordance with Management Procedure QA-2-016 "Plant Modifications". Corrective measures requiring a change in procedures are issued in accordance with Management Procedure QA-2-002 "Management of Documents and Records".
The INPP Training Center incorporates information on its own and the industrial experience into the personnel training process and uses it to improve the training program as required by Management Procedure QA-2-014 "Personnel".

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

The plan for a dry storage facility decommissioning was part of the facility design and was approved in co-ordination with all institutions that participated in the design during the licensing of the facility. According to the existing legislation, a Final Decommissioning Plan for a spent management facility must be prepared 5 years before start of decommissioning, and can be updated as necessary.

***Article 10: Disposal of spent fuel***

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

In 2008, the Government of the Republic of Lithuania approved the revised Strategy on Radioactive Waste Management. For the management of spent nuclear fuel the strategy states that in order to ensure safety of spent nuclear fuel it is essential:

- To construct a new spent fuel storage facility;
- To transfer spent fuel of INPP to the dry storage facilities;
- To analyse the possibilities to dispose spent fuel and long-lived radioactive waste in Lithuania or to reprocess or dispose it in other countries.

Initial studies on geological disposal possibilities of the SF were performed. The main objective was to demonstrate that in principle it is possible to implement a direct disposal of SF in Lithuania in a safe way. The objective does not imply that disposal of spent nuclear fuel will take place in Lithuania. Which option shall be used for the potential disposal of Lithuanian SF is to a large extent a political decision, and this investigation will be an important input to such decision once required.

**Table G-1: Long – lived wastes to be disposed of in a geological repository**

| Waste | Estimates |
|---|---|
| Spent fuel, tons of uranium | 2436 |
| Spent graphite, $m^3$ | 7054 |
| Operational and decommissioning waste, $m^3$ | 5185 |
| Spent sealed sources, (Maišiagala inventory not included) $m^3$ | 19 |

The following main conclusions were made during the studies:

1. Employing present technologies it would in principle be possible to dispose SF and other long-lived high level radioactive wastes into the repository built in the crystalline basement of Lithuania. Modeling of safety relevant radionuclide migration shows that doses to humans will not exceed the existing dose restrictions. Clays having very good confining properties are an alternative media to the crystalline basement.

2. The internationally agreed safety standards that ensure protection of human health and the environment have been applied. Despite a scientific evidence of achievable safety, the implementation of a geological disposal encounters difficulties because of lack of confidence from the politicians and the public.

It is intended to use several means to increase such confidence level:

- assessment and demonstration of performance of the geological repository and in depth involvement of scientific community;
- systematic information of the public about technologies and safety of nuclear installations;
- use of experience from other countries.

## SECTION H. SAFETY OF RADIOACTIVE WASTE MANAGEMENT

***Article 11: 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;*

The principles of radioactive waste management are set forth in the Law on Radioactive Waste Management (See section B) and are in compliant with the IAEA SS No. 111-F.
For managing Low and Intermediate Level Radioactive Waste (LILW), sub-criticality and removal of heat do not represent a specific problem. It is prohibited by the Law on Environmental Protection to reprocess SF as it is only High Level Waste (HLW) according to the waste categorization. The safety of SF management is covered by section G of the report. The regulation "On the Pre-disposal Management and Disposal of Radioactive Waste at the Nuclear Power Plant" states that radioactive waste shall be treated and conditioned in such a way that it complies with the waste acceptance criteria for disposal issued by VATESI. The generic waste acceptance criteria for near surface disposal require that the fissile mass of the waste package shall be limited in such a way that it can be exempted from the transport requirements that apply to transport of fissile material "Regulations for the Safe Transport of Radioactive Material" from IAEA Safety Standards Series No. ST-1.

*(ii) ensure that the generation of radioactive waste is kept to the minimum practicable;*

One of the basic principles established by the Law on Radioactive Waste Management is that the generation of radioactive waste is kept to the practicable minimum. The Regulation on Pre-Disposal Management of Radioactive Waste at NPP, VD-RA-2001-01, requires reduction of waste through reduction of waste at the source of generation, authorised discharge of effluents by minimizing environmental pollution with radionuclides, reuse of equipment and materials and clearance of waste from regulatory control. Waste reduction at the source of generation shall be considered as the most efficient method and shall be implemented by the following:

- careful selection of materials, processes and equipment;
- containment and packaging of radioactive materials to retain integrity;
- decontamination of areas, premises, and equipment and prevention of the spread of contamination;
- detailed analysis of possibilities aiming at minimizing the production of secondary radioactive waste resulting from procedures being used, e.g. decontamination;
- avoidance of introduction of non-radioactive materials (e.g. packing materials) into controlled areas;
- avoidance of materials, decontamination of which is complicated (e.g. wood), in controlled areas.

- operating the reactors in such a way as to avoid fuel failures, and discharging failed fuel from the core as soon as possible;
- reduction of leakage from the main circulation circuit;
- keeping coolant impurity levels as low as practicable.
- used as clean coolant as possible.

*(iii) take into account interdependencies among the different steps in radioactive waste management;*

The waste management principle that interdependencies among the different steps in the radioactive waste management shall be taken into account is required by the Law on Radioactive Waste Management. The requirements are specified in more detail in the regulation VD-RA-2001-01. All the activities from the generation of the waste through to its disposal shall be seen as parts of the process, components of which shall be selected to be compatible with the each others. It is required that a quality assurance programme for the pre-disposal of radioactive waste management shall be developed and implemented by NPP in accordance with the basic quality assurance requirements issued by VATESI and it shall provide adequate confidence that the steps in pre-disposal of radioactive waste management, from generation through conditioning, ensure compliance with known or projected requirements for storage and disposal.

Following requirements on the waste management are related to the waste management steps interdependencies principle:

- *Waste classification*. Solid waste classification scheme references to the disposal method of the particular waste class. Solid waste should be classified according to the treatment method applied at NPP in the following categories: combustible, non-combustible, compactable, non-compactable and non-treatable waste. Liquid radioactive waste shall be classified and segregated according to the chemical nature and the phase state.
- *Collection of waste.* Liquid waste shall be collected in suitable vessels according to the chemical and radiological characteristics and volume of the waste, and the handling and storage requirements. Solid waste shall be collected in proper containers according to the physical and radiological characteristics and volume of the waste, and the handling and storage requirements.
- *Waste processing.* The radioactive waste shall be treated and conditioned in a manner that will give reasonable assurance that the conditioned waste can be accepted for storage, transporting and disposal.
- *Storage.* Each storage facility should have the internal criteria for acceptance of radioactive waste packages for storage. The acceptance criteria for the storage facility shall reflect both the requirements for storage and the known or likely (interim) acceptance criteria for waste disposal.

In the Generic Waste Acceptance Criteria for Near Surface Disposal, VATESI set out the requirement that for each type of conditioned solid and immobilized low and intermediate level short-lived waste the applicant for near-surface disposal NPP shall present a Waste Package Specification (WPS) to RATA for approval before operating a waste conditioning facility.

*(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;*

The protection of individuals, society and the environment against radiological hazards is ensured by the application of requirements established in the legislation (see section E). Operational radiation protection is described on Article 24.
According to the Law on Radioactive Waste Management, before the start of the construction of a radioactive waste management facility, a systematic safety assessment, and an assessment of a likely impact on individuals and the environment must be carried out in accordance with the Law on the Environmental Impact Assessment of Planned Economic Activity. The assessment must be appropriate to the hazard presented by the facility and cover its operating lifetime, for repositories including the post closure period. EIA documentation is produced in accordance with the Law on EIA of the Proposed Economic Activity of the Republic of Lithuania. During EIA potential environmental impacts are analyzed and evaluated. Upon the examination of the EIA report, the conclusions of institutions participating in the EIA process and the evaluation of the motivated proposals by the public and the evaluation of comments of countries participating in transboundary EIA procedure, the competent authority (Ministry of Environment) adopts the justified decision regarding the feasibility to implement the planned activity at the chosen site.
The applicant for the construction license shall submit the SAR to the regulatory authorities. Before start of operation of a radioactive waste management facility, an updated and detailed version of the safety assessment must be prepared. According to the established requirements the SAR shall be periodically renewed. The established period of review of a SAR for the repositories is at least every 10 years. Regarding the existing old radioactive waste management facilities, the Law requires that the operator of the facility thereafter shall perform a safety assessment and submit a report of safety analysis to all the institutions involved in the licensing process. The operator shall make all practicable improvements to upgrade the safety of this facility.

*(v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;*

The radioactive waste management principle of protection against biological, chemical and other hazards that may be associated with radioactive waste management is established by the Law on Radioactive Waste Management. Radioactive waste shall be treated and conditioned in such a way that it complies with the waste acceptance criteria for disposal. Requirements established for disposal of radioactive waste requires that for environmental protection in the post-closure phase, the focus shall be on the protection of the environment from radioactive contaminants including such factors as the content of chemically or biologically toxic materials in the waste. Physical, chemical, and biological characteristics of packages must not put a repository in jeopardy. General waste acceptance criteria for near surface disposal require to consider the following waste properties in addition to properties related to radioactivity: chemical properties (chemical stability and confinement, chemical composition, pyrophoricity, ignitability, reactivity, corrosivity, explosiveness, chemical compatibility, gas generation, toxicity, decomposition of organic wastes), physical properties (permeability and porosity, homogeneity, voidage), mechanical properties (mechanical strength against external stresses, mechanical stability), thermal properties (fire resistance, freeze/thaw stability (take into account temperatures as low as $-40^{o}$C)).

*(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.*

*(vi )and (vii)* the Law on Radioactive Waste Management states that management of radioactive waste must ensure that efforts are made to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation and to avoid imposing undue burdens on future generations. One of the overall objectives of waste disposal established by the Regulation on Disposal of Short Lived LILW, is to fully ensure long-term protection avoiding undue burden of unsolved issues (e.g. technical, financial, organizational or in terms of restriction of resource use) on future generations. A near surface repository shall be designed, constructed and closed to provide the safety of the waste over the long term. According to the existing requirements long term safety assessment shall be performed using the same safety criteria, which are applied at present. It shall be demonstrated that after the expiry of the post-closure surveillance the radiological consequences of events that might break the integrity of the repository and/or the capability of the repository to stem radionuclides will meet the requirements established.

### *Article 12: 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.*

Radioactive waste management facilities were designed as a constituent part of INPP Units at the end of 70s and at the beginning of 80s in accordance with the rules applicable at that time in the former Soviet Union. The storage facility for disused sources and institutional radioactive waste at Maišiagala was built in the 1960s according the rules applicable at that time. A brief technical specification of the facilities is given in section D. Safety of the radioactive waste management system at INPP was evaluated within the framework of licensing the INPP Unit 2 operation. The SAR of Unit 2 covered all radioactive waste management aspects, except the storage facilities for solid radioactive waste and bituminized waste, like emissions to the environment and the monitoring and management of solid, liquid and gaseous waste. In 2000 two SAR's were issued for the existing storage facilities of solid radioactive waste and bitumen compound as interim storage facilities. Objective of the reports are to justify safety of the storage facilities for 10 years. The conclusion is that the waste storage facilities building 155, 155/1 157, 157/1 and 158, can be used as interim storage facilities for the time period ending December 2010. Those facilities are covered by the operational license of INPP Unit 1.
Cement solidification facility for spent ion exchange resins, perlite and evaporator concentrate sediments and the storage facility for cemented waste are constructed according the current legislation. EIA Report and the SAR were produced before construction. The regulatory authorities accepted both documents.
It is recognised that the present radioactive waste management system does not comply with current requirements and shall be modernised. Transition to the new INPP radioactive

waste management system compliant with the new requirements and rules of the Republic of Lithuania as well as up-to-date IAEA and European standards governing solid radioactive waste management, shall be implemented within the scope of the projects for preparation of INPP for decommissioning including construction of the new INPP Solid Radioactive Waste Management and Storage Facility (RWMSF). All collected solid waste shall be retrieved, characterised and treated or conditioned considering the disposal routes. The new RWMSF is projected to be commissioned in year 2011.

Currently, according to the Law on the Management of Radioactive Waste, RATA is responsible for taking radioactive sources from small waste producers, when sources are declared as disused and considered as radioactive waste. From the moment of transfer of disused sealed source from small waste producer to RATA, RATA is taking responsibility to manage radioactive waste. RATA performs conditioning of institutional waste. The conditioned waste is transferred to INPP for intermediate storage. Before radioactive waste will be taken by RATA, managed and transported for long-term storage to INPP radioactive waste storage facility, radioactive waste is temporary stored in equipped temporary storage facilities (according to requirements of HN 89:2001 "Management of Radioactive Waste"). Compliance of temporary storage facilities with the requirements set out in the above mentioned document is controlled during regular inspections.

As mentioned in the National Report of Lithuania, Section F, the Hygiene Standard HN 89:2001 also establishes the requirements and possibilities for management of liquid, solid, gaseous radioactive waste and spent sealed sources.

Institutional waste, meeting the acceptance criteria for near-surface disposal, will be disposed in a near-surface repository. Other waste needs to be disposed in a geological repository or a repository at intermediate depth. There is no final decision on disposal of long-lived waste.

### *Article 13: 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.*

The siting procedure for radioactive waste management facilities is the same as for spent fuel management facilities. All issues are addressed in the Environmental Impact Assessment documentation. Description of the EIA procedure is given on Article 6 in section G.

The EIA for construction of the new solid waste management and storage facility at INPP is finished. A decision regarding the feasibility to construct the new solid waste management and storage facility at the territory of INPP, considering its environmental impacts, was adopted by the Ministry of Environment of Lithuania on 30 November 2007. Latvia and Belarus participated in the EIA procedure, commented on EIA documentation, international consultations regarding their comments also were organised.

In order to implement the provisions of the Radioactive Waste Management Strategy, RATA finished the investigation for a suitable site for the near surface repository. The RATA and Lithuanian scientific institution experts have performed a study "Identification of Candidate Sites for a Near Surface Repository for Radioactive Waste". Objectives of the studies performed were to analyse Lithuanian legal requirements, to summarize the international experience, to exclude territories which are not acceptable according to various ecological, land use and technical criteria, to determine regions with geographical and geological conditions most suitable for the near surface repository, to select several possible suitable sites and to characterize their geological and hydrological structure. It was concluded that a vicinity of INPP is among the best suitable regions for the near surface repository. RATA has identified three possible sites for the NSR. For each site RATA carried out soil investigations and issued a preliminary Environmental Impact Assessment; the chosen site is Stabatiškė near INPP. The Stabatiškė site selected for NSR construction is located in the territory of the Visaginas municipality, about 1 km south from the buildings of the nuclear power plant and about 7 km east from the town Visaginas. The site is in a territory used by INPP. There are no recreational or other resources.

An international peer review for site evaluation for near surface disposal of radioactive waste in Lithuania was organized by RATA and IAEA in December of 2005. The review team concluded that the process of site characterization is being conducted according international good practice. However, the review team provided 41 recommendations to improve and finalise site selection. The recommendations were grouped into the groups:

- Legal and regulatory work for waste management;
- Quality management system;
- Inventory and waste characterisation;
- Site characterisation and quality of characterisation data;
- Repository design;
- Safety assessment.

Some of those recommendations already have been implemented. For example: characterisation of relevant waste streams prior to treatment and conditioning is continued to ensure that the resultant waste form is compatible with the waste acceptance criteria;. the site selection process was transparent, the site criteria and the manner in which they have been applied were publicly available and well documented in EIA; geological properties of the disposal zone at each candidate-site was characterised by direct investigations (e. g. boreholes, including cores for laboratory examination); complex modeling tools were applied for a safety assessment for all sites; in 2008 RATA introduces the ISO 9001 and ISO 14001 quality management systems.

Other recommendations shall be implemented in the nearest future. RATA asked VATESI to define the near surface repository licensing procedures. RATA staff training-programmes for construction and operation of near surface repository will be prepared during special EU project. The selected site for a repository construction will be investigated comprehensively and the received data will be used for safety analysis. The safety assessment task will be continuously developed and will be used for preparation of NSR technical project.

RATA has prepared the EIA report, which was coordinated with many responsible institutions and approved by the Ministry of Environment.

The exact site for near surface repository of the radioactive waste was confirmed by Governmental Resolution of 21 November 2007 No. 1227 on „Designing of Near Surface Repository of the

Radioactive Waste". This resolution was adopted taking into account the decision of the Ministry of Environment of Lithuania No. (1-15)-D8-4796 dated 4 June 2007 „Regarding the Feasibility of Establishing a Near Surface Repository for Low and Intermediate Level Short-lived Radioactive Waste Considering its Environmental Impacts". After examination of the EIA report incorporating the conclusions of relevant parties of EIA regarding the possibility of the proposed activity, remarks of the Ministry of Natural Resources and Environmental Protection of the Republic of Belarus and remarks of the Ministry of Environment of the Republic of Latvia concerning the EIA report, as well as arguments of experts of neighboring countries expressed during international meetings (consultations), the Ministry of Environment of Lithuania decided that two of the three analysed sites were suitable for the construction of the repository and gave priority to one of them.

*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.*

Impact on the society and the environment beyond the border shall be considered within the EIA process of the near surface repository.

It has been recognized that during construction, operation and post-closure periods of the NSR impacts on quality of atmospheric air and water will be insignificant, due to the relatively small size of facility. Also, only non-dangerous materials will be used in the facility. A very small negative impact on aquatic system could occur due to accidental releases of fuels and lubricants and due to discharge of treated savage water. The quality of the discharged water will be systematically controlled.

In the design stage the hydrological conditions of the NSR site will be investigated again taking into account influence of facilities to be constructed in the vicinity (the new INPP Solid Radioactive Waste Storage and Management Facility, the Landfill facility and the New spent fuel storage facility).

The impact for two countries, Belarus and Latvia, has been assessed in the NSR EIA report. These countries are relatively close to the repository sites. In December 2006 RATA presented the results of the EIA to the public of Latvia and Belarus. These countries will not be affected by the planned economic activity.

It was assessed that the construction and normal operation of the new solid waste management and storage facility will have no direct impact of physical nature on social and economic components of Latvia and Belarus. In case of accidents within design and beyond design criteria, the public exposure can be assured to be within acceptable radiation protection limits (with implementation of accident consequences mitigation measures for beyond design accidents, if necessary).

### *Article 14: Design and Construction of Facilities*

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

*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;*

The new Radioactive Waste Management Facilities, mentioned in Section K, as the radioactive waste management modernization projects, shall be designed and constructed in compliance with Article 18 of Section 6 of the Law on Radioactive Waste Management and the requirements as established in approved regulatory documents (see Article 19 in Section E). Impacts on individuals, the society and the environment, including those from discharges or uncontrolled releases for the Cement Solidification and Storage Facilities have been evaluated in the EIA report and Preliminary SAR, previous to the facilities' construction. The Technical Specification for design and construction of a new INPP RW Management Facilities bind the Contractor to propose, in his tender, that the hazardous impact of such waste conditioning and storage technologies shall not exceed the limits set for personnel, the public and the environment taking into account the existing limits valid at INPP.

*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;*

The decommissioning issue of the radioactive waste management facility (RWMF) is considered in assessing the safety of the facility. The PSAR, produced before construction of facility, shall describe the concept of decommissioning of the facility. Engineering and organisational measures for decommissioning of the INPP RWMF, following the expiration of its operating lifetime, shall be included into the scope of the project for the new facility. Decommissioning of existing and new facilities shall be in accordance with the INPP Final Decommissioning Plan. The existing RWMF and the Cement Solidification Facility for INPP decommissioning activities will be covered by the decommissioning projects within INPP.

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

According to the Regulation on Disposal of Low and Intermediate Level Short Lived Radioactive Waste, P-2002-02, and Regulation on Disposal of Very Low Level Radioactive Waste, P-2003-02, and in order to obtain a construction license for the repository, the applicant shall submit a general description of the closure of the repository. Hence, for the new disposal facilities a closure shall be considered at the design stage. The existing Maišiagala storage facility for institutional waste is closed according to the typical project for such facility, but in 2011 a storage decommissioning plan will be prepared.

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

A Cement Solidification Facility for spent resins, perlite and evaporator concentrate sediments is designed based on worldwide experience. The cement solidification technology of liquid radioactive waste is one of the most advanced, well developed and practically proven technologies for waste conditioning. The technique of immobilizing radioactive waste in cement has been used in the nuclear industry and at nuclear research centers for more than 40 years. The technical specification for design and construction of a new INPP RA Management Facilities binds the contractor to tender, for such waste conditioning and storage practices that have already been licensed in some Western European countries or that are based on approved experience of commercial operation of the proposed facilities.
The concept of the Landfill Facility for Short-Lived Very Low Level Waste has been analyzed and proposed by Studsvik RadWaste AB ("INPP Landfill" Studsvik/RW-04/17, Studsvik RadWaste AB, 2004-04-06) on the basis of experience of design and operation of such facilities in Sweden.
The concept of the near surface repository for the short-lived LILW is developed on the basis of experience of design of similar facilities in other countries. The NSR conceptual (reference) design that has been prepared by a consortium, is based on the experience of disposal facilities of L`Aube Centre (France) or El Cabril (Spain), and will be an input for the Basic Engineering

Design. The Reference Design is based on a clay embedded concrete cell construction protected by a top cover. The NSR is located above the groundwater table with a bottom clay bed resting on a firm basis above the groundwater table. According to the RATA Lithuanian clay should be used, based on their research. The top cover comprises layers with boulders/pebbles, sandy gravel and salty sand above the clay material. A layer of sand is required for distribution of gas and a layer of moraine is required to obtain the required incline of the top cover. The suitability of the layers forming the top cover will have to be demonstrated. After placement of the radioactive waste disposal containers, the empty void is foreseen to be backfilled. Backfilling of the interior of the disposal cells with other materials such as gravel or no backfilling at all, will be an issue for study in the Technical Design. The NSR closure method will be based on a concrete lid and covering layers to be identified during the technical design phase, progressive closure could be possible. NSR covering layers and closure methodology will need to consider the unfavourable weather and geological conditions in Lithuania.

***Article 15: 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;*

Due to the fact that a separate safety analysis was not required at the time of designing INPP units, safety analysis of the existing INPP radioactive waste management facilities was performed within the framework of licensing INPP Unit 1 and Unit 2 (see also article 12). Before the installation of the cement solidification facility for spent resins, perlite and evaporator concentrate sediments and construction of the storage facility for conditioned waste, the EIA report and the Preliminary SAR were produced and approved by the regulatory body. Safety assessment of the new INPP RWMSF shall be performed in compliance with the normative standards of the Republic of Lithuania as foreseen in tender requirements for contract of the RWMSF project. The EIA Report and SAR for this project will need approval from the state institutions of the Republic of Lithuania. The safety assessment and the EIA for the INPP Landfill facility are being developed in compliance with the normative standards of the Republic of Lithuania as spelled out in contract clause for the Landfill Facility for Short-Lived Very Low Level Waste.

*(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;*

The siting of the near surface repository for short-lived LILW is finished.

The preliminary selection of sites for the Landfill Facility for short-lived VLLW was carried out within the framework of the Preliminary Waste Acceptance Criteria for IPP Landfill. The safety assessment and the EIA for the INPP Landfill Disposal, covering both operational and post closure periods, are being developed in compliance with the normative standards of the Republic of Lithuania. Design and construction of repositories shall be carried out according established requirements (see Article 11).

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

The Final SAR has been issued for the cement solidification facility and the storage facility for solidified waste on the basis of the Preliminary SAR, subject to regulatory approval previous to issuing the operating license, and commissioning test results. Final SAR's have to be prepared for the other waste management modernisation projects.

***Article 16: Operation of Facilities***

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

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

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

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

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

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

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

*(vii) programmes to collect and analyse 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.*

**INPP SOLID RADIOACTIVE WASTE MANAGEMENT PRACTICES**

Based on its activity level solid radioactive waste (SRW) is sorted in the SRW accumulation areas within the INPP controlled area. Waste of the respective group is loaded into the dedicated transport containers (for this group of waste) and transported to the SRW storage facilities. Waste is also sorted according to physical form into combustible and non-combustible. A standard registration certificate is issued for each filled waste container. Containers loaded with Group I and II waste are weighed prior to being offloaded in the storage facility. The data for the waste from each individual container are entered into the electronic database and recorded on the registration certificate. The following data are entered:

- registration certificate number,
- accumulation point,
- date of dispatch,
- waste group,
- waste characteristic (combustible, non-combustible)
- container number,
- waste volume,
- waste weight;
- SRW dose rate,
- facility, canyon number for waste to be loaded,
- SRW nuclide composition.

For volume reduction, the combustible Group I waste is transported to INPP building 150, a compaction facility. The following waste is compacted: cotton waste, paper, personal protection means, overalls, rubber articles, filters with wooden casing, wood with the dimensions not exceeding 300x30 mm. The gamma-radiation dose rate of the compacted waste shall not exceed 0,3 mSv/h. Waste is accumulated in plastic bags, and once fully loaded, the bags are tied up to prevent waste scattering.

Sorting of waste and labeling of bags are performed at the place of accumulation. The final inspection and, if needed, the additional sorting is performed before loading the compacted waste into the transport containers.

Containers with compacted waste are transported to building 150 by motor vehicles. Compacted waste briquettes (volume of each ~ 1m$^3$, weight: 500 – 700 kg) are wrapped into film, registered and transported to facility 157/1 by motor vehicles (offloaded by crane and loaded into dedicated compartments).

All waste is separately loaded into the storage facility according to its activity. The combustible waste is loaded separately from non-combustible waste.

All waste is loaded into bulk compartments (except compacted).

Following the offloading of the SRW containers, the special motor vehicles and containers are checked on radiation contamination in building 159. In case, the radiation contamination level of motor vehicles and containers exceeds set limits, they will be decontaminated in building 159 by personnel from the Decontamination Department. Dosimetric control of the special motor vehicles and containers could be performed by the portable device at the point of their offloading at the facilities 157, 157/1, 155/1.

To monitor the presence of water being able to pump the water each compartment is equipped with a device of a 600 mm diameter pipe, perforated into the lower part. Water from compartments is pumped into the special sewage system and later treated in the INPP liquid radioactive waste treatment facility.

The combustible waste storage compartments are equipped with automatic fire detection and extinguishing systems.

The SRW is transported in compliance with procedures that are based on existing normative standards.

Since December 1988, the INPP started accepting spent sealed sources for storage. Until 20 December 2000, spent sealed sources were loaded into compartments of facilities 155/1, 157 and 157/1 together with other waste. Since October 2000, the spent sealed sources loaded into protective casks are put into dedicated containers depending on the dose rate and source type (α, β, γ) and are then stored in a dedicated compartment of building 157/1 separately from other radioactive waste.

## ACCOUNTING OF SOLID RADIOACTIVE WASTE

The accounting of SRW, stored in facilities 157, 157/1, 155, 155/1, is carried out individually for each facility and compartment in a special logbook and database according to the following indices:

- Activity groups,
- Waste volume $m^3$,
- Waste mass, kg,
- Waste type (combustible, non-combustible),
- Waste radionuclide composition.

Certificates of each waste batch (containers) are registered in the electronic database and special logbook and have the following data:

- Waste delivery date,
- Waste shipment point,
- Storage location (facility and compartment number),
- Waste volume ($m^3$),
- Waste mass (kg),
- Waste group,
- Waste radiation dose rate (mSv/h),
- Registration certificate number,
- Waste type (combustible, non-combustible),
- Surname of an official handing in waste,
- Surname of health physicist,
- Surname and signature of an official accepting waste for storage.

Prior to offloading the SRW into the storage facility, waste nuclide composition is measured by a gamma-spectrometer located in building 159, and waste is weighed on platform scales attached to the ceiling of facility 157/1. Data on waste radionuclide composition and weight are entered into the registration certificate and database.

Accounting of stored waste (volume, mass, total activity and activity of each nuclide) in the electronic database is performed monthly, quarterly and annually for each facility and each compartment.

The amount of compacted waste (bales) is also recorded in the electronic database, as well as on the registration certificates of compacted bales are archived.

The INPP's Decontamination Department draws up a report on the SRW being loaded into storage facilities indicating waste group, waste volume, waste mass and total activity on a quarterly basis by the 10th of the next month. Reports are submitted to the INPP's Production Engineering Division, the Radiation Protection Center and VATESI. Besides, the report on stored RW is annually submitted to VATESI.

## INPP LIQUID RADIOACTIVE WASTE MANAGEMENT PRACTICES

The liquid radioactive waste (LRW) at INPP is collected in special tanks, from where it is transferred to the evaporating facilities. The storage system for the LRW, residual distillation of evaporation units, spent ion exchange resin and filter-perlite is located in building 151/154. The LRW storage system includes the following: six tanks 1500 $m^3$ each, two tanks 5000 $m^3$ each, and ancillary equipment. The drainage water (DW) and emergency drainage water (EDW) are received from two units through common pipelines. The DW is stored in two tanks of 1500 $m^3$ each, the EDW are stored in two tanks of 5000 $m^3$ each. The sewage water of the washing facility and installation 159, due to presence of surface active material, are received through a separate pipeline, and stored in a 1500 $m^3$ tank and is periodically processed separately of the rest of drainage water, delivering unconditioned condensate into the DW and the EDW collection tanks. The pulp of spent ion-exchange resin and perlite is received from both units through different pipelines and is stored in two 1500 $m^3$ tanks under a sheet of water. At present, one tank is full and the other is being filled. In 2006, the license for operation of the cementation facility and the temporary cementation waste storage facility №1/2006 was received. During 2006-2007, 152.4$m^3$ of ion-exchange resins and perlite were reprocessed, and 214 casks have been stored.

The residual distillation from evaporation units is stored in a 1500 $m^3$ tank, and it is periodically processed on bituminization facilities. Then, the bitumen compound is pumped into a special storage (build. 158). The non-soluble admixtures, contained in the DW and the EDW, as well as in the sewage water of the washing facility are accumulated in the tanks to allow for time to form sediment.

The operating license of the existing SRW and bituminised waste storage facilities granted by VATESI for the period of 10 years, up to 2011, is based on safety assessments. By then (planned in 2011), a new INPP RWMSF is to be designed, constructed and licensed for operation. The new facility shall provide for a new waste management, conditioning and storage system with a new radioactive waste classification compliant with the new laws and regulations of the Republic of Lithuania and consistent with the European Union standards and IAEA recommendations. The designed operating lifetime of the new facility will be 30 years. The designed operating lifetime of the interim facilities for storage of the radioactive waste packages will not be less than 50 years. A license for the construction of the Cement Solidification Facility and the Storage Building for the solidified waste was granted in 2003 based on a Safety Assessment as required by legislation. Other existing management facilities at INPP and the complete waste management system are licensed under the operational license of NPP Unit 2. The safety of these facilities has been justified within scope of the SAR for INPP Unit 2.

The commissioning programme for the Cement Solidification Facility and the Storage Building has been developed and implemented. Prior to start-up of the new RWMSF, the Operator (INPP) shall develop the acceptance and commissioning programme in accordance with the format required by law, and other legal documents to be approved by VATESI.

The operational limits and conditions shall be defined and, in case necessary, shall be specified in the course of operation and based on tests and operational experience of thy facility.

The operation, maintenance, monitoring and testing are established and conducted in compliance with the standards and rules, as well as the internal operational manuals, procedures and instructions.

The safety of the facility shall be ensured and impact on personnel, the public and the environment shall be monitored during its complete operating lifetime. Throughout the operating lifetime is must therefore be ensured that personnel with relevant knowledge and experience is available to operate the facility. In 1995 a group for the handling of spent nuclear fuel and radioactive waste was established as part of the INPP Engineering Support Department, to provide engineering and technical support in the field of spent nuclear fuel handling.

The radioactive waste is sorted in compliance with the procedures currently existing at INPP, as described in the Radioactive Waste Management Practices above.

All data on events significant to safety are timely and in due manner reported to VATESI, the Ministry of Environment and the Radiation Protection Centre under the Ministry of Health of the Republic of Lithuania. The reporting procedure is the same as for the spent fuel management facilities and described on item (vi) of Article 9 in Section G.
The information on operating experience of the RA Management and the Storage Facility is analysed and applied for development of measures for upgrading operation within the overall the INPP Quality Assurance System. More detailed description is given in item (vii) of Article 9 in Section G
The operation of the RA Management and the Storage Facility, as well as its decommissioning project, are included in the overall INPP Decommissioning Plan where issues related to quality assurance of activities and safety are considered in an integral manner and in close interaction between all system elements.
Currently there are no disposal facilities in operation. As mentioned in item (iii) of Article 14, a general description of the closure of the repository is part of the submitted licensing documents for the construction license of the repository. Before the start of closure of operations, the operational licensee shall submit to VATESI, the Ministry of Environment and RPC a detailed closure plan and obtain an authorization for the execution thereof to VATESI, the Ministry of Environment and the RPC. Such detailed closure plan shall include: an updated safety assessment based on available pertinent data; the proposed procedures for decontamination, removing or sealing redundant structures, systems and equipment; details of the proposed closure method, including the materials and techniques to be used and its expected performance; a justification of the materials and techniques to be used, based on experience and analysis; types of the post-closure surveillance that should be put in place after closure has been completed and the ways of records keeping and management.

**ACCOUNTING OF HAZARDOUS WASTE:**

In accordance with INPP waste management procedures, the hazardous waste is accumulated, accounted and handed over to a special licensed company for further treatment. If the hazardous waste is contaminated, then radioactive waste management safety procedures cover the safety requirements for hazardous waste handling.

### *Article 17: 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; and*

*(iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.*

In Lithuania exists an institutional radioactive waste storage facility – the Maišiagala storage (the description is provided in Section D).

In 2006, the physical security of the Maišiagala storage was significantly improved, by introducing new video surveillance system of the site, lightning, new fence, entrance control. Inside the repository site a permanent guard force  is installed.
The Environmental monitoring at the site started in 1993. The monitoring comprises of the following: dose rate measurements, monitoring of tritium activity concentration in groundwater, gamma spectrometry of soil samples, measurements of total beta-activity in groundwater samples. The samples for the laboratory analysis are taken quarterly. In 2006, a new Environmental monitoring program was approved by regulatory authorities.
In 2005, within the framework of international support, RATA prepared the SAR and the proposals for safety improvement, which were approved by VATESI, RPC and the Ministry of Environment. The radiological safety was improved by installing additionally engineered barriers, consisting of double layer height density polyethylene membrane, grave and special drainage system made from concrete.

RATA obtained the post closure surveillances license for the Maišiagala storage facility in 2006.

## SECTION I. TRANSBOUNDARY MOVEMENT

***Article 27: Transboundary movement***

*1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.*

Thereby:

*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;*

The Laws on the Management of Radioactive Waste and on the Nuclear Energy establish the general provisions of export, transport within the country, the transit of radioactive waste and spent nuclear fuel and the order of return of disused sealed sources. These laws prohibit transport of radioactive waste and spent nuclear fuel without a license. The order of issuance of permits needed for transport of radioactive waste is established in the Regulations on Import, Export, Transit, Transport within the Country of Radioactive Materials and Waste (hereafter – Regulations). Requirements of the abovementioned laws, the IAEA Regulations for the Safe Transport of Radioactive Materials, TS-R-1 (1996), Council directive 92/3/Euratom, Council regulation 1493/93/Euratom, and Commission decision 93/552/Euratom are incorporated in the Regulations. After receiving the request for the authorization from the consignor regarding the shipment, the country competent authority forwards such application for approval to the competent authorities of the country of destination and of the country or countries of transit. If all transport conditions are met, the authorization is issued to the consignor of radioactive waste and the competent authorities of countries of destination and/or transit are notified by sending a copy of the permit. The State Border Guard Service and the Customs Department control that radioactive waste and spent fuel is not transported out, or transported into, a country without appropriate authorization.

Specific attention is given to the management of disused sealed sources. With the aim to decrease the amounts of radioactive waste in Lithuania, legal acts have established additional requirements for import of sealed sources into Lithuania. In such cases, it is obligatory to obtain a written commitment  from the source provider to return the sealed source after its disuse and to contract RATA for the management of the source in case, due to arisen circumstances, it would be imposible to return the source to the suplier, and to have an insurance for the value equivalent to the money value of RATA services.

It is forbiden to import radioactive waste. It is possible only in case if the source was produced in Lithuania and is being returned for final disposal. At present, there are no manufacturing or reprocesing practices here in Lithuania, and consequently disused sealed sources are not imported.

*ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;*

Acknowledging the provisions of the Laws on Management of Radioactive Waste and Nuclear Energy, the radioactive waste shall be transported, exported or transited in accordance with the provisions of the international agreements ratified by the Republic of Lithuania, laws of the Republic of Lithuania and other legal acts regulating transportation of radioactive waste and spent nuclear fuel. It is allowed to export and transit the radioactive waste and spent nuclear fuel only after notification of the country of destination, and upon receipt of approval of that country according to established order. These provisions are implemented by Regulations, which set forth that radioactive waste can be transported by air, water, railways or road, if the legal acts that regulate the requirements of transport of dangerous goods via the appropriate transport mode, allow for such transport. During the issuing process of the license for transport of radioactive waste, the compliance of shipment procedures with the Law on Carriage of Dangerous Goods by Car, Rail and Inland Waterway, IAEA Regulations for the Safe Transport of Radioactive Materials, TS-R-1 (1996), IAEA TS-G-1.1 (2002) has been evaluated and other legislation, such as:

1) during transport by road – A and B Technical Annexes of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) (2003 Edition);
2) during transport by air – Annex 18 of the International Civil Aviation Convention of the International Civil Aviation Organization and DOC 9284-AN/905 „Technical Instructions for the Safe Transport of Dangerous Goods by Air“;
3) during transport by sea – the requirements of the International Maritime Dangerous Goods (IMDG) Code of the International Maritime Organization (IMO);
4) during transport by railway – the requirements of the Convention concerning International Carriage by Rail (COTIF) and Annex 2 „Regulations for Transport of Dangerous Goods" of the Agreement for Transport of International Goods of the Organization for Railways Cooperation (OSZhD).

*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;*

According to provisions of the Law on the Management of Radioactive Waste of the Republic of Lithuania, it is prohibited to import the radioactive waste and spent nuclear fuel into Lithuania, except in cases where radioactive waste is transported in transit or radioactive waste and spent nuclear fuel is returned to Lithuania as the country of origin. It is established in Lithuania that the administrative and technical capacity for management of the spent fuel or the radioactive waste shall be consistent with this Convention.

*iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;*

According to provisions of the Law on the Management of Radioactive Waste of the Republic of Lithuania, the radioactive waste may be transported only to such states that have the administrative and technical capacity to receive it, as well as the regulatory and other structures, needed to manage radioactive waste in accordance with the Joint Convention on the Safety of Spent Fuel

Management and on the Safety of Radioactive Waste Management. It is ensured that radioactive waste and spent nuclear fuel is exported and transited only after notification of the country of destination, and upon receipt of the approval of that country according to established order.

*v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.*

It is foreseen in the legal acts of the country, that consignor of the radioactive waste and the spent nuclear fuel shall take back the waste, if the shipment cannot be finished or if the conditions for the shipment are not fulfilled. The appropriate state authorities control, that radioactive waste and spent nuclear fuel is returned to the holder in Lithuania, and in case the radioactive waste is shipped from a non-EU Member State to the Republic of Lithuania, it is controlled, that the consignee of the waste agrees with waste holder, who is in a non-EU Member State, on his responsibility to take back the waste, if it is not possible to carry out its shipment. Yet there were no such cases in the practice.

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

The provisions of the Law on Management of Radioactive Waste foresee, that it is prohibited to export radioactive waste for disposal in sites lying south of 60 degrees latitude South.

# SECTION J. DISUSED SEALED SOURCES

## *Article 28: Disused sealed sources*

*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.*

The basic requirements for the management of disused sealed sources, as radioactive waste are established in the Law on the Management of Radioactive Waste.
Detail requirements are set by the Regulation “On the Pre-disposal Management of Radioactive Waste at the Nuclear Power Plant”, approved by the Head of VATESI at 2001, in Lithuanian Hygiene Standard HN 89:2001 “Management of Radioactive Waste” (2001) and other normative legal acts.
In the Regulations of Licensing the Practices Involving Sources of Ionizing Radiation the requirement is set, that before the license to operate with sources of ionizing radiation is issued, the plan for radioactive waste management must be provided to the regulatory authority. In this plan the way and methods of the radioactive waste management must be presented.
The licensee must, besides other duties, dispose sealed sources that are disused or not suitable for use anymore (also those, which after the technical examination and evaluation of practices in which they are used, the RPC requires to dispose) in terms, approved by the RPC.
Before radioactive waste will be transported for disposal to INPP’s radioactive waste storage facility, radioactive waste is stored in temporary storage facilities as equipped in special premises (as required by HN 89:2001 “Management of Radioactive Waste”). The special requirements set for temporary storage facilities are:

1) the temporary storage facilities must be divided in work areas and its boundaries must be marked;
2) the access to and departure from the temporary storage facilities must be controlled;
3) the safety and security of temporary storage facilities must be warranted by means of physical security (alarm), the door of facility musts be marked with signs of ionizing radiation;
4) the surface of walls and floor of temporary storage facilities must be smooth, covered with materials, which can be easily decontaminated;
5) the temporary storage facilities must be equipped with ventilation systems;
6) it is prohibited to keep extraneous objects and equipments that are not involved in radioactive waste management in temporary storage facilities;
7) at the exits of the temporary storage facilities equipment for the control of radiation contamination of workers as well as individual protection means must be arranged.

Compliance with the requirements as set above at temporary storage facilities is controlled during regularly inspections. The licensee has to maintain compliance with these requirements.
To allow for actions by public institutions in cases where an illegal source (including orphan sources) is found, determined or suspended, the Government of Lithuania approved the “Management with Illegal Sources of Ionizing Radiation and Objects, Contaminated with Radionuclides”.
Such actions and tasks are determined in the Regulations, for situations when a report is

received that an illegal source, or material contaminated with radionuclides, was obtained, kept, transported or when radioactive material is manufactured.
The data about sealed sources which were in use in Lithuania in period of 2005-2007 are presented in figure J-1 below.

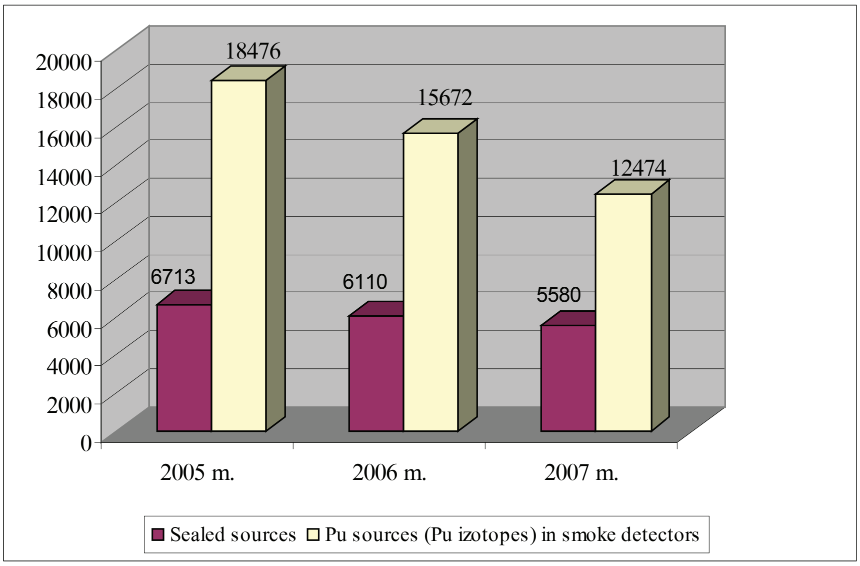


**Figure J-1: Sealed radioactive sources, which were in use in Lithuania in period of 2005-2007**

Disused sealed sources are transferred to RATA that after appropriate treatment will transport them to the INPP's radioactive waste storage facility for storage.

*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.*

Re-entry into Lithuanian territory of disused sources is possible only in case if these sources were produced in Lithuania. At present, there are no manufacturers who are working in this area, so import of disused sealed sources is not possible.
The State Register of Ionizing Sources and Doses of Workers is established in Lithuania. The data about all sources which are in use, or are stored by users in Lithuania, are collected and recorded in this register. The safety of sources is checked and controlled during regularly inspections.
By implementing the IAEA Code of Conduct on the Safety and Security of Radioactive Sources and the legalizing statements of Council Directive 2003/122/EURATOM, the sources are divided into 5 risk categories.
The sources of risk categories I-III are considered as high activity sources and special safety and security requirements are applied for these categories.

Licensees must by order, upon receipt of sources, report to the RPC within a period of 10 days, as established in legal acts. It is also obligatory to perform the annual inventory of the sources every year and provide the inventory data to the RPC. The sealed sources can be eliminated from the state register only when they are disposed to the radioactive waste storage facility, or if they are returned to the country of origination.

There are no manufacturing or reprocessing practices in Lithuania, and consequently the disused sealed sources are not imported.

## SECTION K. PLANNED ACTIVITIES TO IMPROVE SAFETY

*I NPP*

INPP has a program of continuous improvement for safety of the radioactive waste and spent fuel handling.

It is supposed that all activities on the modernization of the radioactive waste handling system will be performed until 2011. The modernization of the radioactive waste handling system includes the change to a new classification, compliant with international standards, and the construction and commissioning of solid radioactive waste storage and processing facilities in 2011. The content of the project for new solid radioactive waste storage and management facility, a retrieval facility (to retrieve waste from the existing storage) and the solid radioactive waste treatment facility, which scope includes facilities for:

- receipt of retrieved solid radioactive waste (SRW);
- sorting;
- fragmentation;
- compaction of combustible low level SRW;
- combustion of combustible medium and low level waste;
- super-compaction of medium and low level waste;
- compacting in containers;
- cementation;
- decontamination of transport containers;
- measurement and accounting;
- transport system'
- interim storage for the SRW bales.

A modular design storage facility is planned to be constructed with the storage capacity of one module of 2500 $m^3$ for treated short-lived waste (in to be disposed containers) and 2000 $m^3$ for long-lived waste (in storage containers).

The other radioactive waste management modernization projects, currently under implementation or recently implemented are:

- The Cement Solidification Facility for spent ion exchange resins, perlite and evaporator concentrate sediments and the storage facility for solidified waste have been operating since March 2006. Information on these facilities is provided in Section D.
- A free release facility for operational waste ensuring that clearance levels are not exceeded was commissioned in 2006.
- A new SNFSF will be constructed at the territory of INPP. It will be dedicated for the rest of the spent fuel (one storage facility already exists). It shall start operation in 2010. The information on this facility is provided in articles 6 and 7.
- The Free release facility for decommissioning waste shall be commissioned in 2008.
- Investigations shall be performed and a decision shall be taken whether the bituminized radioactive waste storage facility could be converted into a repository or not. Depending

on the decision, the bituminized radioactive waste storage facility shall be licensed as a repository or the bituminized waste shall be retrieved and enclosed into suitable containers as required for storage, transport and disposal in the near surface repository.

*Disposal Facilities*

It is planed to construct a disposal facility for VLLW and a disposal facility short lived LILW.

The content of the project for the landfill facility for short lived VLLW includes buffer storage for waste awaiting landfill disposal (with capacity of about 4000 $m^3$ of packaged waste) and 3 landfill disposal modules (each module has capacity of 20000 $m^3$ of packaged waste). The contract for design of the whole landfill facility and construction and commissioning of the buffer storage for waste awaiting landfill disposal was signed. Construction and commissioning of the Landfill disposal modules are planned under separate contract in 2011 – 2012.

The near surface repository concept for short-lived LILW is based on the Reference Design, which has been prepared by the consortium. Important updates of the concept were proposed during the process of the EIA. The basic principles for the proposed reference design are location above the ground water of a hill-type construction with reinforced concrete vaults and engineered low-permeable barriers. Safety of the disposed waste should be ensured by a multiple barrier system as follows: the waste matrix, waste packaging or container, backfill, concrete vault and surrounding low permeable clay as well as the natural barrier.

The NSR Reference Design has been developed for a disposal volume of conditioned waste of 100,000 $m^3$. However, the planned repository is a modular type facility, therefore it should be easy to adapt for other disposal volumes by reducing or increasing the number of vaults. As waste disposal in the NSR occurs over a long period of time, for practical and financial reasons the disposal vaults will be built section by section to keep up with the disposal rate.
The disposal rates should be based on quantity of conditioned operational and decommissioning waste placed in the waste packages stored in the interim storage facilities at INPP.
The waste packages from decommissioning (large size containers) will not be interim stored on the INPP site and will be directly transported to the NSR for disposal.
The present technical and functional requirements are developed on a basis of an Environmental Impact Assessment Report approved by competent Lithuanian authorities and a conceptual (Reference) Design.
The NSR should meet following criteria:

- Waste emplacement: fully automatic and manual.
- Design life time of the disposal vaults, sealing and water drainage system: 300 years.
- Passive post-operational safety system.
- Active institutional control: not less 100 years.
- .Passive institutional control: not less 200 years.
- Design life time of storage and other auxiliary buildings: 30 years.

The near surface repository will increase safety in the region. It will be built by using the best experience that exists in the world and accumulated during operation equivalent repositories in other countries such as Sweden, France, and Spain.

## SECTION L. ANNEXES

### Annex 1: Summary of major changes in the area of spent fuel and radioactive waste management in Lithuania since the presentation of the last Report

On 10 March 2006, the authorization was given to operate the Cement Solidification Facility at INPP for the spent ion exchange resins, perlite and evaporator concentrate sediments and the storage facility for cemented waste. Information on these facilities is provided in Section D.

The Government Resolution No. 1227, dated 2007-11-21, regarding design of the Near Surface Repository for LILW-SL Radioactive Waste was issued. According to this resolution the repository will be constructed at the Stabatiškė site which is about 1 km from the INPP. The approximate volume of waste to be disposed in the facility is 100 000$m^3$.

In 2008, INPP applied for a license to design storage and disposal facilities for very low level waste. VATESI reviews this application. The potential sites for the disposal facility are located near INPP, but the selection process is not finished yet. The volume of the storage facility will be 4000 $m^3$ and volume of disposal facility will be 60 000 $m^3$.

In 2004-2006, the safety assessment and upgrading of the Maišiagala was performed. The Maišiagala facility was originally designed as final repository, but the safety assessment showed that the facility meets only storage facility requirements. The Maišiagala storage was essentially upgraded by installing new radiological and physical protection barriers and license for operation of the storage facility was issued in 2006. No new waste is put there. The decommissioning plan of this facility shall be prepared in the future.

The Radioactive Waste Management Strategy was revised and approved in 2008.

On 19 April 2007, a license to design a new SF storage facility was issued by VATESI. The technical design documentation and preliminary safety analysis report was prepared and is under revision by authorities.

On 23 November 2007, a license to design the SRW treatment and storage facility was issued by VATESI. The technical design documentation and preliminary safety analysis report was prepared, revision by authorities was done. The operator is preparing an updated version of the preliminary safety analysis report and after final approval of all documentation the license for construction will be issued.

On 29 February 2008, a license to design the SRW retrieval facility (to retrieve waste from the existing storage at INPP) was issued by VATESI. Technical design documentation and a preliminary safety analysis report is in preparation.

In 2005, the capacity of the existing SF storage facility at INPP was 20 CASTOR RBMK casks and 60 CONSTOR RBMK. After the modification of the facility, the capacity increased up to 20 CASTOR RBMK casks and 78 CONSTOR RBMK. Currently, (2008-07-02) the modification is being implemented to increase the storage capacity up to additional 10 CONSTOR RBMK casks.

The preliminary study was prepared for the bituminized radioactive waste storage facility in order to know if it could be converted into a repository or not. It was decided that more investigations are needed. Depending on the decision, the bituminized radioactive waste storage facility shall be licensed as a repository or the bituminized waste shall be retrieved and enclosed into suitable containers as required for storage, transport and disposal in the near surface repository. For the moment no decision is taken.

The free release facility for operational waste ensuring that clearance levels are not exceeded commissioned in 2006.

Some legal acts were updated. See Section E.

The data on quantity of all radioactive waste in existing storage facilities as for 2008-03-01 were updated. See section L Annex 2.

## Annex 2. Inventory of radioactive waste in Lithuania

The volume of the waste from small producers is only about 1-2 m$^3$ per year, so more than 99% of radioactive waste in Lithuania is produced at INPP. Inventory of the Maišiagala storage facility is presented in Section F, *iv),* c). Inventory for INPP is presented in the tables below:

**Table L-1: Inventory of the waste at INPP in volume (Spent fuel not included)**

| **Solid radioactive waste, 2008 January 1 at INPP** | | | | | | |
|---|---|---|---|---|---|---|
| Type of waste | 1 group combustible | 1 group non-combustible | 2 group combustible | 2 group non-combustible | 3 group | Total volume |
| Volume of the waste (m$^3$) | 11 362 | 8 046 | 2 140 | 2 735 | 805 | 25 088 |
| Bituminized waste - 12730 m$^3$ | | | | | | |
| **Liquid radioactive waste, 2008 January 1 at INPP** | | | | | | |
| Ion-exchange resins, filter aid, evaporator concentrate sediments - 3746 m$^3$ | | | | | | |

## Inventory of radioactive waste in deferent storage facilities at INPP

**Table L-2: Building 155: Group 1 Combustible Waste**

| | |
|---|---|
| Outer dimensions: | Width 22, length 37, height 4.45 m |
| Walls: | 620 mm concrete + 4 mm carbon steel lining |
| Compartments: | 1 |
| Capacity: | 2 400 m$^3$ |
| Contents: | 2 400 m$^3$ Group 1, combustible waste |
| Status: | Full, date of closure 6/1990 |
| SSSs: | Yes |
| Remarks: | Sand (685 m$^3$, 960 tons) |

**Table L-3: Building 155/1: Group 1 Combustible Waste**

| | |
|---|---|
| Outer dimensions: | Width 22, length 31, height 4.24 m |
| Walls: | 720 mm concrete + 4 mm carbon steel lining |
| Compartments: | 3 |
| Capacity: | 2 000 $m^3$ |
| Contents: | 2 000 $m^3$ Group 1, combustible waste |
| Status: | Full, date of closures:<br>Compartment 1: 2/1991<br>Compartment 2: 6/1993<br>Compartment 3: 1/1999 |
| SSSs: | In compartments 1 & 2 |
| Remarks: | 286 bales in comp. 3 |

**Table L-4: Building 157: Group 1, 2 & 3 Solid Waste (excl. comp. 1 & 4)**

| | |
|---|---|
| Outer dimensions: | width 28.6, length 32, height 9.7 m |
| Walls: | 600 mm concrete |
| Compartments: | 15 |
| Capacity: | 6 790 $m^3$ |
| Contents: | Group 1 Combustible: 2 340 $m^3$<br>Group 1 Non-combustible: 940 $m^3$<br>Group 2 Combustible: 1 170 $m^3$<br>Group 2 Non-combustible: 960 $m^3$<br>Group 3 Non-combustible: 805 $m^3$ |
| Status: | Full (excl. comp. 1 & 4), date of closures:<br>4/1987 – 9/1989 |
| SSSs: | In compartments 1, 4, 5, 6, 8, 11, 13 |
| Remarks: | Metallic waste is mixed with combustible waste in compartments 8 and 11 (see Chapter A4.5.2.1) |
| **Compartments 1 & 4; Group 3 Waste** | |
| Outer dimensions: | Width 16, length 12, height 10.7 m |
| Walls: | 1 m concrete (roof 1.4 m) |
| Capacity: | Compartment 1: 695 $m^3$<br>Compartment 4: 685 $m^3$ |
| Contents: | Compartment 1: 196 $m^3$<br>Compartment 4: 609 $m^3$ |
| Status: | In operation |
| SSSs: | In both compartments |

**Table L-5: Building 157/1: Group 1 & 2 Solid Waste and SSS's**

| | |
|---|---|
| Outer dimensions: | Width 28.6, length 82, height 9.7 m |
| Walls: | 700 mm concrete |
| Compartments: | Group 1 & 2 Solid Waste: 28<br>Spent Sealed Sources: 1 |
| Capacity: | 17 340 $m^3$ |
| Contents: | Group 1 Combustible: 4 222 $m^3$<br>Group 1 Non-combustible: 7 106 $m^3$<br>Group 2 Combustible: 970 $m^3$<br>Group 2 Non-combustible: 1 755 $m^3$<br>Spent Sealed Sources: |
| Status: | Full: Compartments 1 – 7, 9 – 16, 18/1, 18/2, 19/1, 20/1, date of closure 6/1992 – 4/2007<br>In operation: Compartments 8, 17, 18/3, 19/2, 19/3, 21/1, 21/2<br>Empty: Compartments 20/2, 20/3, 21/3 |
| SSSs: | In compartments 10 – 14, 16 & 18/3 |
| **Compartment 18/3; Spent Sealed Sources** | |
| Outer dimensions: | Width 5.2, length 9.4, height 9.7 m |
| Walls: | 700 mm concrete |
| Capacity: | 380 $m^3$ |
| Contents: | 4 containers (see Chapter A4.8.6) with SSS's (17 451 pieces) |
| Status: | In operation |

**Table L-6**
**Quantity and characteristics of waste stored in building 155 at 01.03.2008**

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FACILITY STATUS** | Full (6/1990) | | | | | | | | | | | | | |
| **AVERAGE WASTE AGE** | 14.7 y | | | | | | | | | | | | | |
| **WASTE CLASSIFICATION** | **Radiological** | **Physical** | **Waste Form** | | | | | | | | | | | |
| | Group 1 | Combustible | In bulk | | | | | | | | | | | |
| **WASTE VOLUME** | 2 400 $m^3$ | | | | | | | | | | | | | |
| **WASTE MASS** | 708 tons | | | | | | | | | | | | | |
| **PHYSICAL COMPOSITION** | **Combustible** | | | | | **Non-combustible** | | | | | | | | |
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** | | |
| **(In % vol.)** | 40 – 50% | 15 – 20% | 15 – 20% | 15 – 20% | No | No | No | No | No | No | Yes[1] | Yes[2] | | |
| **GENERAL RADIOLOGICAL PROPERTIES** | **Total Activity** | **Specific Activity** | | **Surface Dose Rate [3]** | | | | | | | | | | |
| | 3.11E13 Bq | 4.40E10 Bq/t | 1.30E10 Bq/$m^3$ | < 0.3 mSv/h | | | | | | | | | | |
| **RADIONUCLIDE COMPOSITION** | $^{60}Co$ [4] | $^{137}Cs$ [4] | $^{14}C$ | $^{244}Cm$ | $^{90}Sr$ | $^{59}Ni$ | $^{63}Ni$ | $^{94}Nb$ | $^{129}I$ | $^{241}Am$ | $^{238}Pu$ | $^{239}Pu$ | $^{240}Pu$ | $^{241}Pu$ |
| | 1.9E12 | 2.6E13 | 6.2E10 | 9.6E7 | 1.5E11 | 1.3E10 | 2.9E12 | 2.5E10 | 1.3E8 | 8.6E8 | 5.5E8 | 1.6E8 | 3.6E8 | 2.91E10 |
| **RELEVANT COMMENTS** | [1] Sand used to extinguish fire. Amount 685 $m^3$ 960 tons. Loaded in two stages, 345 $m^3$ during first stage and 340 $m^3$ during second. In between the storage was filled with additional waste. Sand is not included in the physical waste composition presented above.<br>[2] Spent Sealed Sources: 92 sources in 20 packages (shielded containers, metal boxes, plastic box, drum)<br>[3] At the time of waste production<br>[4] Radionuclides used as scaling factor in evaluation of other nuclides | | | | | | | | | | | | | |

**Table L-7**
**Quantity and characteristics of waste stored in building 155/1 at 01.03.2008**

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FACILITY STATUS** | **Comp. 1** | **Comp. 2** | **Comp. 3** | | | | | | | | | | | |
| | Full (2/1991) | Full (6/1993) | Full (1/1999) | | | | | | | | | | | |
| **AVERAGE** | **Comp. 1** | **Comp. 2** | **Comp. 3** | | | | | | | | | | | |
| **WASTE AGE** | 11.5 y | 9.8 y | 4.9 y | | | | | | | | | | | |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** | | | | | | | | | | | |
| **CLASSIFICATION** | Group 1 | Combustible | In bulk, comp. 3 bales | | | | | | | | | | | |
| | **Comp. 1** | **Comp. 2** | **Comp. 3** | | | | | | | | | | | |
| **WASTE VOLUME** | 800 m$^3$ | 800 m$^3$ | 400 m$^3$ (286 bales, 20 m$^3$ in bulk) | | | | | | | | | | | |
| **WASTE MASS** | 310 tons | 310 tons | 205 tons | | | | | | | | | | | |
| | **Combustible** | | | | | **Non-combustible** | | | | | | | | |
| **PHYSICAL COMPOSITION** | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** | | |
| **(In % vol.)** | 40 – 50 % | 15 – 20% | 15 – 20 % | 15 – 20 % | No | No | No | No | No | No | No | Yes[1] | | |
| **GENERAL RADIOLOGICAL** | **Total Activity** | | **Specific Activity** | | | **Surface Dose Rate [2]** | | | | | | | | |
| **PROPERTIES** | Comp. 1 | 1.02E13 Bq | 3.31E10 Bq/t | 9.76E9 Bq/m$^3$ | | < 0.3 mSv/h | | | | | | | | |
| | Comp. 2 | 1.05E13 Bq | 3.38E10 Bq/t | 9.98E9 Bq/m$^3$ | | < 0.3 mSv/h | | | | | | | | |
| | Comp. 3 | 1.96E10 Bq | 9.56E7 Bq/t | 6.53E7 Bq/m$^3$ | | < 0.3 mSv/h | | | | | | | | |
| **RADIONUCLIDE COMPOSITION** | $^{60}$Co [3] | $^{137}$Cs [3] | $^{14}$C | $^{244}$Cm | $^{90}$Sr | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{129}$I | $^{241}$Am | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu |
| **Comp. 1** | 7.2E11 | 8.7E12 | 1.5E10 | 3.4E7 | 5.2E10 | 3.2E9 | 7.2E11 | 6.1E9 | 4.0E7 | 2.7E8 | 1.8E8 | 5.0E7 | 1.1E8 | 1.0E10 |
| **Comp. 2** | 8.2E11 | 8.9E12 | 1.4E10 | 3.5E7 | 5.3E10 | 2.9E9 | 6.6E11 | 5.6E9 | 3.9E7 | 2.6E8 | 1.8E8 | 4.9E7 | 1.1E8 | 1.1E10 |
| **Comp. 3** | 1.6E9 | 1.7E10 | 1.4E7 | 7.3E4 | 1.0E8 | 3.0E6 | 6.9E8 | 5.6E6 | 6.7E4 | 4.6E5 | 3.2E5 | 8.5E4 | 1.9E5 | 2.4E7 |
| **RELEVANT COMMENTS** | [1] Spent Sealed Sources: Compartment 1: >100 packages Compartment 2: 4 packages<br>[2] At the time of waste production<br>[3] Radionuclides used as scaling factor in evaluation of other nuclides | | | | | | | | | | | | | |

**Table L-8 Quantity and characteristics of waste stored in building 157, compartments 9 and 11 – 15 at 01.03.2008**

| | | | | | | |
|---|---|---|---|---|---|---|
| **FACILITY STATUS** | **Comp. 9** | **Comp. 11** | **Comp. 12** | **Comp. 13** | **Comp. 14** | **Comp. 15** |
| | Full (8/1987) | Full (8/1988) | Full (9/1988) | Full (8/1989) | Full (7/1989) | Full (2/1988) |
| **AVERAGE** | **Comp. 9** | **Comp. 11** | **Comp. 12** | **Comp. 13** | **Comp. 14** | **Comp. 15** |
| **WASTE AGE** | 14.6 y | 13.5 y | 13.5 y | 12.9 y | 12.9 y | 14.3 y |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** | | | |
| **CLASSIFICATION** | Group 1 | Combustible | In bulk | | | |
| | **Comp.** 9 | **Comp.** 11 | **Comp. 12** | **Comp. 13** | **Comp. 14** | **Comp. 15** |
| **WASTE VOLUME** | 390 $m^3$ | 390 $m^3$ | 390 $m^3$ | 390 $m^3$ | 390 $m^3$ | 390 $m^3$ |
| **WASTE MASS** | 117 tons | 117 tons | 118 tons | 117 tons | 118 tons | 120 tons |

| **PHYSICAL COMPOSITION** | **Combustible** | | | | | **Non-combustible** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| **(In % vol.)** | 40 – 50 % | 15 – 20% | 15 – 20 % | 15 – 20 % | No | Yes[1] | No | No | No | No | No | Yes[2] |

| **GENERAL RADIOLOGICAL PROPERTIES** | | **Total Activity** | **Specific Activity** | | **Surface Dose Rate [3]** |
|---|---|---|---|---|---|
| | Comp. 9 | 2.93E12 Bq | 2.51E10 Bq/t | 7.52E9 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 11 | 3.02E12 Bq | 2.58E10 Bq/t | 7.75E9 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 12 | 3.02E12 Bq | 2.56E10 Bq/t | 7.74E9 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 13 | 3.03E12 Bq | 2.59E10 Bq/t | 7.77E9 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 14 | 3.05E12 Bq | 2.58E10 Bq/t | 7.82E9 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 15 | 2.97E12 Bq | 2.47E10 Bq/t | 7.61E9 Bq/$m^3$ | <0.3 mSv/h |

| **RADIONUCLIDE COMPOSITION** | $^{60}$Co [4] | $^{137}$Cs [4] | $^{14}$C | $^{244}$Cm | $^{90}$Sr | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{129}$I | $^{241}$Am | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Comp. 9** | 1.5E11 | 2.5E12 | 5.0E9 | 9.3E6 | 1.5E10 | 1.1E9 | 2.3E11 | 2.0E9 | 1.2E7 | 8.3E7 | 5.4E7 | 1.6E7 | 3.5E7 | 2.8E9 |
| **Comp. 11** | 1.8E11 | 2.6E12 | 4.9E9 | 9.7E6 | 1.5E10 | 1.0E9 | 2.3E11 | 2.0E9 | 1.2E7 | 8.3E7 | 5.4E7 | 1.6E7 | 3.5E7 | 2.9E9 |
| **Comp. 12** | 1.8E11 | 2.6E12 | 4.9E9 | 9.7E6 | 1.5E10 | 1.0E9 | 2.3E11 | 2.0E9 | 1.2E7 | 8.3E7 | 5.4E7 | 1.6E7 | 3.5E7 | 2.9E9 |
| **Comp. 13** | 1.9E11 | 2.6E12 | 4.8E9 | 9.8E6 | 1.5E10 | 1.0E9 | 2.3E11 | 2.0E9 | 1.2E7 | 8.2E7 | 5.3E7 | 1.5E7 | 3.4E7 | 3.0E9 |
| **Comp. 14** | 1.9E11 | 2.6E12 | 4.8E9 | 9.9E6 | 1.5E10 | 1.0E9 | 2.2E11 | 1.9E9 | 1.2E7 | 8.3E7 | 5.4E7 | 1.5E7 | 3.5E7 | 3.0E9 |
| **Comp. 15** | 1.6E11 | 2.5E12 | 5.0E9 | 9.4E6 | 1.5E10 | 1.1E9 | 2.3E11 | 2.0E9 | 1.2E7 | 8.3E7 | 5.4E7 | 1.6E7 | 3.5E7 | 2.8E9 |

| **RELEVANT COMMENTS** | [1] Parts of decommissioned Emergency Cooling System: Compartment 11<br>[2] Spent Sealed Sources: At least 2 packages in compartment 13<br>[3] At the time of waste production<br>[4] Radionuclides used as scaling factor in evaluation of other nuclides |
|---|---|

**Table L-9 Quantity and characteristics of waste stored in building 157, compartments 7, 8 and 10 at 01.03.2008**

| | | | |
|---|---|---|---|
| | **Comp. 7** | **Comp. 8** | **Comp. 10** |
| **FACILITY STATUS** | Full (6/1989) | Full (3/1988) | Full (9/1989) |
| **AVERAGE** | **Comp. 7** | **Comp. 8** | **Comp. 10** |
| **WASTE AGE** | 12.8 y | 13.9 y | 13.0 y |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** |
| **CLASSIFICATION** | Group 2 | Combustible | In bulk |
| | **Comp. 7** | **Comp. 8** | **Comp. 10** |
| **WASTE VOLUME** | 390 $m^3$ | 390 $m^3$ | 390 $m^3$ |
| **WASTE MASS** | 98 tons | 100 tons | 98 tons |

| **PHYSICAL COMPOSITION** | **Combustible** | | | | | **Non-combustible** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| **(In % vol.)** | 25 % | 40 % | 10 – 15 % | 15 – 20 % | No | Yes[1] | No | No | No | No | Yes | Yes[2] |

| **GENERAL RADIOLOGICAL PROPERTIES** | | **Total Activity** | **Specific Activity** | | **Surface Dose Rate [3]** |
|---|---|---|---|---|---|
| | Comp. 7 | 1.21E13 Bq | 1.24E11 Bq/t | 3.10E10 Bq/$m^3$ | 0.3 – 10 mSv/h |
| | Comp. 8 | 1.16E13 Bq | 1.16E11 Bq/t | 2.98E10 Bq/$m^3$ | 0.3 – 10 mSv/h |
| | Comp. 10 | 1.19E13 Bq | 1.22E11 Bq/t | 3.06E10 Bq/$m^3$ | 0.3 – 10 mSv/h |

| **RADIONUCLIDE COMPOSITION** | $^{60}$Co [4] | $^{137}$Cs [4] | $^{14}$C | $^{244}$Cm | $^{90}$Sr | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{129}$I | $^{241}$Am | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Comp. 7** | 1.4E12 | 8.9E12 | 3.6E10 | 3.4E7 | 5.3E10 | 7.6E9 | 1.7E12 | 1.4E10 | 4.2E7 | 2.8E8 | 1.8E8 | 5.3E7 | 1.2E8 | 1.0E10 |
| **Comp. 8** | 1.2E12 | 8.7E12 | 3.5E10 | 3.2E7 | 5.2E10 | 7.4E9 | 1.6E12 | 1.4E10 | 4.2E7 | 2.8E8 | 1.8E8 | 5.3E7 | 1.2E8 | 9.8E9 |
| **Comp. 10** | 1.3E12 | 8.8E12 | 3.5E10 | 3.3E7 | 5.2E10 | 7.5E9 | 1.6E12 | 1.4E10 | 4.2E7 | 2.8E8 | 1.8E8 | 5.2E7 | 1.2E8 | 1.0E10 |

| | |
|---|---|
| **RELEVANT COMMENTS** | [1] Parts of decommissioned Emergency Cooling System in compartment 8<br>[2] Spent Sealed Sources: Compartment 8 one package with 2 Pu-238 sources (4.3E10 Bq)<br>[3] At the time of waste production<br>[4] Radionuclides used as scaling factor in evaluation of other nuclides |

**Table L-10 Quantity and characteristics of waste stored in building 157 Compartments 3 and 6 at 01.03.2008**

| | | | |
|---|---|---|---|
| | **Comp. 3** | **Comp. 6** | |
| **FACILITY STATUS** | Full 6/1987 | Full 4/1987 | |
| **AVERAGE** | **Comp. 3** | **Comp. 6** | |
| **WASTE AGE** | 14.7 y | 15.9 y | |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** |
| **CLASSIFICATION** | Group 1 | Non-combustible | In bulk |
| | **Comp. 3** | **Comp. 6** | |
| **WASTE VOLUME** | 470 $m^3$ | 470 $m^3$ | |
| **WASTE MASS** | 260 tons | 259 tons | |

| | **Combustible** | | | | | **Non-combustible** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PHYSICAL COMPOSITION** | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| **(In % vol.)** | No | No | No | No | No | 20 – 35% | 27 – 35% | 15 – 20% | No | 30% | 2% | 1%[1] |

| | | **Total Activity** | **Specific Activity** | | **Surface Dose Rate** [2] |
|---|---|---|---|---|---|
| **GENERAL** | | | | | |
| **RADIOLOGICAL** | Comp. 3 | 3.53E12 Bq | 1.36E10 Bq/t | 7.50E9 Bq/$m^3$ | < 0.3 mSv/h |
| **PROPERTIES** | Comp. 6 | 3.44E12 Bq | 1.32E10 Bq/t | 7.32E9 Bq/$m^3$ | < 0.3 mSv/h |

| **RADIONUCLIDE COMPOSITION** | $^{60}$Co [2] | $^{137}$Cs [2] | $^{14}$C | $^{244}$Cm | $^{90}$Sr | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{129}$I | $^{241}$Am | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Comp. 3** | 1.8E11 | 3.0E12 | 6.0E9 | 1.1E7 | 1.8E10 | 1.3E9 | 2.8E11 | 2.4E9 | 1.5E7 | 1.0E8 | 6.4E7 | 1.9E7 | 4.2E7 | 3.3E9 |
| **Comp. 6** | 1.6E11 | 3.0E12 | 6.2E9 | 1.1E7 | 1.8E10 | 1.3E9 | 2.8E11 | 2.5E9 | 1.5E7 | 1.0E8 | 6.4E7 | 1.9E7 | 4.3E7 | 3.2E9 |

| | |
|---|---|
| **RELEVANT COMMENTS** | [1] Spent Sealed Sources: About 100 of packages (different types) in compartment 6<br>[2] At the time of waste production<br>[3] Radionuclides used as scaling factor in evaluation of other nuclides |

## Table L-11 Quantity and characteristics of waste stored in building 157 Compartments 2 and 5 at 01.03.2008

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Comp. 2** | **Comp. 5** | | | | | | | | | | | | |
| **FACILITY STATUS** | Full (9/1987) | Full (12/1987) | | | | | | | | | | | | |
| **AVERAGE** | **Comp. 2** | **Comp. 5** | | | | | | | | | | | | |
| **WASTE AGE** | 15.7 y | 14.5 y | | | | | | | | | | | | |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** | | | | | | | | | | | |
| **CLASSIFICATION** | Group 2 | Non-combustible | In bulk | | | | | | | | | | | |
| | **Comp. 2** | **Comp. 5** | | | | | | | | | | | | |
| **WASTE VOLUME** | 480 m³ | 480 m³ | | | | | | | | | | | | |
| **WASTE MASS** | 220 tons | 240 tons | | | | | | | | | | | | |
| | **Combustible** | | | | | **Non-combustible** | | | | | | | | |
| **PHYSICAL COMPOSITION** | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** | | |
| **(In % vol.)** | No | No | No | No | No | 50 – 70% | 20% | 20 – 25% | Yes [2] | No | Yes | Yes[1] | | |
| **GENERAL** | **Total Activity** | | **Specific Activity** | | **Surface Dose Rate [3]** | | | | | | | | | |
| **RADIOLOGICAL** | Comp. 2 | 1.34E13 Bq | 6.10E10 Bq/t | 2.80E10 Bq/m³ | 0.3 – 10 mSv/h | | | | | | | | | |
| **PROPERTIES** | Comp. 5 | 1.43E13 Bq | 5.94E10 Bq/t | 2.97E10 Bq/m³ | 0.3 – 10 mSv/h | | | | | | | | | |
| **RADIONUCLIDE COMPOSITION** | $^{60}Co$ [4] | $^{137}Cs$ [4] | $^{14}C$ | $^{244}Cm$ | $^{90}Sr$ | $^{59}Ni$ | $^{63}Ni$ | $^{94}Nb$ | $^{129}I$ | $^{241}Am$ | $^{238}Pu$ | $^{239}Pu$ | $^{240}Pu$ | $^{241}Pu$ |
| **Comp. 2** | 1.1E12 | 1.0E13 | 4.2E10 | 3.7E7 | 6.0E10 | 9.0E9 | 1.9E12 | 1.7E10 | 5.1E7 | 3.4E8 | 2.2E8 | 6.4E7 | 1.5E8 | 1.1E10 |
| **Comp. 5** | 1.4E12 | 1.1E13 | 4.5E10 | 3.9E7 | 6.3E10 | 9.5E9 | 2.1E12 | 1.8E10 | 5.2E7 | 3.5E8 | 2.2E8 | 6.5E7 | 1.5E8 | 1.2E10 |
| **RELEVANT COMMENTS** | [1] Spent Sealed Sources: Compartment 5, one package (type ???) with 2 Co60 sources (2.6E9 Bq) and one package (type ???-? ) with 5 Cs137 sources (9.8E8 Bq)<br>[2] For radionuclide properties of graphite, see Chapter 8.1<br>[3] At the time of waste production<br>[4] Radionuclides used as scaling factor in evaluation of other nuclides | | | | | | | | | | | | | |

## Table L-12 Quantity and characteristics of waste stored in building 157 Compartments 1 and 4 at 01.03.2008

| | | | |
|---|---|---|---|
| **FACILITY STATUS** | **Comp. 1** | **Comp. 4** | |
| | In operation | In operation | |
| **AVERAGE** | **Comp. 1** | **Comp. 4** | |
| **WASTE AGE** | 11.0 y | 11.0 y | |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** |
| **CLASSIFICATION** | Group 3 | Non-combustible | In bulk |

| | Comp. 1 | | Comp. 4 | | Annual Arising (total) |
|---|---|---|---|---|---|
| | Zr-alloys | Other | Zr-alloys | **Other** | |
| **WASTE VOLUME** | 29 m³ | 167 m³ | 79 m³ | 530 m³ | 32 m³ |
| **WASTE MASS** | 33.0 tons | 190.0 tons | 81.2 tons | 544.8 tons | ~33 tons |

| **PHYSICAL COMPOSITION (In % vol.)** | Combustible | | | | | Non-combustible | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| | No | No | Yes [1] | Yes [2] | No | 97 % | No | No | No | No | No | Yes[3] |

| **GENERAL RADIOLOGICAL PROPERTIES** | | | **Total Activity** | **Specific Activity** | | **Surface Dose Rate [4]** |
|---|---|---|---|---|---|---|
| | Comp. 1 | **Zr-alloys** | 2.71E14 Bq | 1.32E13 Bq/t | 1.19E13 Bq/m³ | > 10 mSv/h |
| | | **Other** | 1.24E15 Bq | 6.70E12 Bq/t | 7.81E12 Bq/m³ | > 10 mSv/h |
| | Comp. 4 | **Zr-alloys** | 1.22E15 Bq | 2.61E13 Bq/t | 2.35E13Bq/m³ | > 10 mSv/h |
| | | **Other** | 5.56E15 Bq | 1.32E13 Bq/t | 1.39E13 Bq/m³ | > 10 mSv/h |

| **RADIONUCLIDE COMPOSITION [6]** | | $^{60}$Co [5] | $^{3}$H | $^{14}$C | $^{55}$Fe | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{93}$Zr |
|---|---|---|---|---|---|---|---|---|---|
| **Comp. 1** | **Zr-alloys** | 2.7E14 | 2.0E7 | 2.3E11 | 1.6E11 | 5.9E9 | 9.7E11 | 3.3E12 | 4.2E10 |
| | **Other** | 2.7E14 | - | 4.5E12 | 4.4E14 | 4.9E12 | 5.2E14 | - | - |
| **Comp. 4** | **Zr-alloys** | 1.2E15 | 9.0E7 | 1.0E12 | 7.2E11 | 2.6E10 | 4.4E12 | 1.5E13 | 1.9E11 |
| | **Other** | 1.2E15 | - | 2.0E13 | 2.0E15 | 2.2E13 | 2.4E15 | - | - |

**RELEVANT COMMENTS**

[1] Filters from Hot Cell ventilation system
[2] PVC baskets used as a liner in transport casks
[3] Spent Sealed Sources: Compartments 1: 13 packages Compartment 4: 7 packages
[4] At the time of waste production
[5] Radionuclide used as scaling factor in evaluation of other nuclides
[6] Contamination by fission products and actinides not considered
Other: It is estimated that 10 % (weight) of the waste consists of Zr-alloy (2.5 % Nb) and it contains 50% of $^{60}$Co activity

## Table L-13 Quantity and characteristics of waste stored in building 157/1 compartments 1 – 4, 6, 7 and 9 at 01.03.2008

| FACILITY STATUS | Comp. 1 | Comp. 2 | Comp. 3 | Comp. 4 | Comp. 6 | Comp. 7 | Comp. 9 |
|---|---|---|---|---|---|---|---|
| | Full (12/1994) | Full (6/1992) | Full (3/1993) | Full (6/1992) | Full (1/1997) | Full (12/1993) | Full (3/1999) |
| **AVERAGE WASTE AGE** | **Comp. 1** | **Comp. 2** | **Comp. 3** | **Comp. 4** | **Comp. 6** | **Comp. 7** | **Comp. 9** |
| | 7.5 y | 10.1 y | 9.2 y | 9.8 y | 6.0 y | 8.5 y | 3.9 y |
| **WASTE CLASSIFICATION** | **Radiological** | **Physical** | **Waste Form** | | | | |
| | Group 1 | Combustible | In bulk | | | | |
| | **Comp. 1** | **Comp. 2** | **Comp. 3** | **Comp. 4** | **Comp. 6** | **Comp. 7** | **Comp. 9** |
| **WASTE VOLUME** | 380 m$^3$ | 380 m$^3$ | 380 m$^3$ | 380 m$^3$ | 380 m$^3$ | 380 m$^3$ | 380 m$^3$ |
| **WASTE MASS** | 114 tons | 116 tons | 118 tons | 117 tons | 108 tons | 124 tons | 96 tons |

| PHYSICAL COMPOSITION (In % vol.) | Combustible | | | | | Non-combustible | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| | 40 – 50% | 15 – 20% | 15 – 20% | 15 – 20% | No | No | No | No | No | No | No | Yes[1] |

| GENERAL RADIOLOGICAL PROPERTIES | | Total Activity | Specific Activity | | Surface Dose Rate [2] |
|---|---|---|---|---|---|
| | Comp. 1 | 6.37E12Bq | 5.59E10 Bq/t | 1.68E10 Bq/m$^3$ | < 0.3 mSv/h |
| | Comp. 2 | 1.96E12Bq | 1.69E10 Bq/t | 5.15E9 Bq/m$^3$ | < 0.3 mSv/h |
| | Comp. 3 | 2.93E12Bq | 2.48E10 Bq/t | 7.71E9 Bq/m$^3$ | < 0.3 mSv/h |
| | Comp. 4 | 2.89E12Bq | 2.47E10 Bq/t | 7.62E9 Bq/m$^3$ | < 0.3 mSv/h |
| | Comp. 6 | 2.06E12Bq | 1.91E10 Bq/t | 5.41E9 Bq/m$^3$ | < 0.3 mSv/h |
| | Comp. 7 | 1.77E12Bq | 1.43E10 Bq/t | 4.66E9 Bq/m$^3$ | < 0.3 mSv/h |
| | Comp. 9 | 5.24E9 Bq | 5.45E7 Bq/t | 1.38E7 Bq/m$^3$ | < 0.3 mSv/h |

| RADIONUCLIDE COMPOSITION | $^{60}$Co [3] | $^{137}$Cs [3] | $^{14}$C | $^{244}$Cm | $^{90}$Sr | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{129}$I | $^{241}$Am | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Comp. 1 | 2.8E12 | 1.8E12 | 3.5E10 | 7.6E6 | 1.1E10 | 7.4E9 | 1.7E12 | 1.4E10 | 7.7E6 | 5.2E7 | 3.5E7 | 9.7E6 | 2.2E7 | 2.4E9 |
| Comp. 2 | 2.7E11 | 1.4E12 | 4.8E9 | 5.7E6 | 8.6E9 | 1.0E9 | 2.3E11 | 1.9E9 | 6.4E6 | 4.3E7 | 2.9E7 | 8.0E6 | 1.8E7 | 1.8E9 |
| Comp. 3 | 3.1E11 | 2.4E12 | 4.8E9 | 9.4E6 | 1.4E10 | 1.0E9 | 2.3E11 | 2.0E9 | 1.0E7 | 6.9E7 | 4.6E7 | 1.3E7 | 2.9E7 | 3.0E9 |
| Comp. 4 | 3.4E11 | 2.3E12 | 5.7E9 | 8.9E6 | 1.3E10 | 1.2E9 | 2.7E11 | 2.3E9 | 9.9E6 | 6.7E7 | 4.5E7 | 1.2E7 | 2.8E7 | 2.8E9 |
| Comp. 6 | 8.3E11 | 7.8E11 | 8.7E9 | 3.3E6 | 4.7E9 | 1.8E9 | 4.2E11 | 3.5E9 | 3.1E6 | 2.1E7 | 1.5E7 | 3.9E6 | 8.9E6 | 1.1E9 |
| Comp. 7 | 3.3E11 | 1.2E12 | 4.7E9 | 4.8E6 | 7.2E9 | 1.0E9 | 2.3E11 | 1.9E9 | 5.1E6 | 3.5E7 | 2.3E7 | 6.4E6 | 1.5E7 | 1.5E9 |
| Comp. 9 | 8.9E8 | 4.0E9 | 7.0E6 | 1.7E4 | 2.4E7 | 1.5E6 | 3.5E8 | 2.8E6 | 1.5E4 | 1.0E5 | 7.1E4 | 1.9E4 | 4.3E4 | 5.7E6 |

**RELEVANT COMMENTS**

[1] Spent Sealed Sources: 4 packages in compartment 9
[2] At the time of waste production
[3] Radionuclides used as scaling factor in evaluation of other nuclides

## Table L-14 Quantity and characteristics of waste stored in building 157/1 compartment 5 at 01.03.2008

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **FACILITY STATUS** | **Comp. 5** | | | | | | | | | | | | | |
| | Full (4/1998) | | | | | | | | | | | | | |
| **AVERAGE** | **Comp. 5** | | | | | | | | | | | | | |
| **WASTE AGE** | 6.6 y | | | | | | | | | | | | | |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** | | | | | | | | | | | |
| **CLASSIFICATION** | Group 2 | Combustible | In bulk | | | | | | | | | | | |
| | **Comp. 5** | **Comp. 8** | **Annual Arising** | **Comments** | | | | | | | | | | |
| **WASTE VOLUME** | 380 $m^3$ | - | 75 $m^3$ | Note that also compartment 18/2 is in operation for storage of Group 2 combustible waste | | | | | | | | | | |
| **WASTE MASS** | 95 tons | - | ~20 tons | | | | | | | | | | | |
| | **Combustible** | | | | | **Non-combustible** | | | | | | | | |
| **PHYSICAL COMPOSITION** | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Material** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** | | |
| **(In % vol.)** | 25 % | 40 % | 10 – 15 % | 15 – 20 % | No | No | No | No | No | No | No | No | | |
| **GENERAL RADIOLOGICAL** | **Total Activity** | | **Specific Activity** | | **Surface Dose Rate [1]** | | | | | | | | | |
| **PROPERTIES** | Comp. 5 | 8.25E12 Bq | 8.68E10 Bq/t | 2.17E10 Bq/$m^3$ | 0.3 – 10 mSv/h | | | | | | | | | |
| **RADIONUCLIDE COMPOSITION** | $^{60}$Co [2] | $^{137}$Cs [2] | $^{14}$C | $^{244}$Cm | $^{90}$Sr | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{129}$I | $^{241}$Am | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu |
| **Comp. 5** | 3.2E12 | 3.2E12 | 3.6E10 | 1.3E7 | 1.9E10 | 7.7E9 | 1.8E12 | 1.5E10 | 1.3E7 | 8.8E7 | 6.0E7 | 1.6E7 | 3.7E7 | 4.3E9 |
| **RELEVANT COMMENTS** | [1] At the time of waste production<br>[2] Radionuclides used as scaling factor in evaluation of other nuclides | | | | | | | | | | | | | |

**Table L-15 Quantity and characteristics of waste stored in building 157/1 compartments 10 – 15 at 01.03.2008**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **FACILITY STATUS** | **Comp. 10** | **Comp. 11** | **Comp. 12** | **Comp. 13** | **Comp. 14** | **Comp. 15** | |
| | Full (10/1995) | Full (9/1994) | Full (3/1997) | Full (4/1999) | Full (5/2002) | Full (8/2006) | |
| **AVERAGE** | **Comp. 10** | **Comp. 11** | **Comp. 12** | **Comp. 13** | **Comp. 14** | **Comp. 15** | |
| **WASTE AGE** | 8.4 y | 7.9 y | 5.5 y | 3.7 y | ? | ? | |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** | | | | |
| **CLASSIFICATION** | Group 1 | Non-combustible | In bulk | | | | |
| | **Comp. 10** | **Comp. 11** | **Comp. 12** | **Comp. 13** | **Comp. 14** | **Comp. 15** | **Annual Arising** |
| **WASTE VOLUME** | 1160 $m^3$ | 1160 $m^3$ | 1160 $m^3$ | 1160 $m^3$ | 1160 $m^3$ | 1160 $m^3$ | 350 $m^3$ |
| **WASTE MASS** | 654 tons | 658 tons | 804 tons | 837 tons | 842 tons | 783 tons | ~210 tons |

| **PHYSICAL COMPOSITION ( In % vol.)** | **Combustible** | | | | | **Non-combustible** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| | No | No | No | No | No | 20 – 35% | 27 – 35% | 15 – 20% | No | 30% | 2% | 1%[1] |

| **GENERAL RADIOLOGICAL PROPERTIES** | | **Total Activity** | **Specific Activity** | | **Surface Dose Rate [2]** |
|---|---|---|---|---|---|
| | Comp. 10 | 7.99E12Bq | 1.22E10 Bq/t | 6.89E9 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 11 | 9.07E12Bq | 1.38E10 Bq/t | 7.82E9 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 12 | 3.58E10Bq | 4.45E7 Bq/t | 3.08E7 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 13 | 5.44E10 Bq | 6.50E7 Bq/t | 4.69E7 Bq/$m^3$ | <0.3 mSv/h |

| **RADIONUCLIDE COMPOSITION** | $^{60}Co$ [3] | $^{137}Cs$ [3] | $^{14}C$ | $^{244}Cm$ | $^{90}Sr$ | $^{59}Ni$ | $^{63}Ni$ | $^{94}Nb$ | $^{129}I$ | $^{241}Am$ | $^{238}Pu$ | $^{239}Pu$ | $^{240}Pu$ | $^{241}Pu$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Comp. 10** | 2.2E12 | 4.2E12 | 3.2E10 | 1.7E7 | 2.5E10 | 6.7E9 | 1.5E12 | 1.3E10 | 1.8E7 | 1.2E8 | 8.0E7 | 2.2E7 | 5.0E7 | 5.4E9 |
| **Comp. 11** | 3.0E12 | 4.1E12 | 3.9E10 | 1.7E7 | 2.4E10 | 8.4E9 | 1.9E12 | 1.6E10 | 1.7E7 | 1.2E8 | 7.9E7 | 2.2E7 | 4.9E7 | 5.4E9 |
| **Comp. 12** | 2.0E9 | 3.2E10 | 2.0E7 | 1.8E5 | 1.9E8 | 4.2E6 | 9.7E8 | 8.0E6 | 1.3E5 | 8.8E5 | 6.0E5 | 1.6E5 | 3.7E5 | 4.5E7 |
| **Comp. 13** | 8.9E9 | 4.2E10 | 6.8E7 | 1.8E5 | 2.5E8 | 1.4E7 | 3.4E9 | 2.7E7 | 1.6E5 | 1.1E6 | 7.5E5 | 2.0E5 | 4.5E5 | 6.1E7 |

| | |
|---|---|
| **RELEVANT COMMENTS** | [1] Spent Sealed Sources: Compartments 10 – 14<br>[2] At the time of waste production<br>[3] Radionuclides used as scaling factor in evaluation of other nuclides |

## Table L-16 Quantity and characteristics of waste stored in building 157/1 compartments 8 and 21/2 at 01.03.2008

| | | |
|---|---|---|
| **FACILITY STATUS** | **Comp. 8** | **Comp. 21/2** |
| | In operation | In operation |

| | | |
|---|---|---|
| **AVERAGE** | **Comp. 8** | **Comp. 21/2** |
| **WASTE AGE** | - | - |

| | | | |
|---|---|---|---|
| **WASTE** | **Radiological** | **Physical** | **Waste Form** |
| **CLASSIFICATION** | Group 1 | Non-combustible | In bulk |

| | | | |
|---|---|---|---|
| | **Comp. 8** | **Comp. 21/2** | **Annual Arising** |
| **WASTE VOLUME** | 115.8 $m^3$ | 30.6$m^3$ | |
| **WASTE MASS** | 61.3 tons | 16.2tons | |

| **PHYSICAL COMPOSITION ( In % vol.)** | **Combustible** | | | | | **Non-combustible** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| | No | No | No | No | No | 68% | 10-12% | 8-10% | No | No | No | 7% |

| **GENERAL** | | **Total Activity** | **Specific Activity** | | **Surface Dose Rate [2]** |
|---|---|---|---|---|---|
| **RADIOLOGICAL** | Comp. 8 | 1.47E10 Bq | 2.40E8 Bq/t | 1.27E8 Bq/$m^3$ | <0.3 mSv/h |
| **PROPERTIES** | Comp. 21/2 | 7.75E9 Bq | 1.38E10 Bq/t | 7.82E9 Bq/$m^3$ | <0.3 mSv/h |

| **RADIONUCLIDE COMPOSITION** | $^{60}Co$ [2] | $^{137}Cs$ [2] | $^{14}C$ | $^{244}Cm$ | $^{90}Sr$ | $^{59}Ni$ | $^{63}Ni$ | $^{94}Nb$ | $^{129}I$ | $^{241}Am$ | $^{238}Pu$ | $^{239}Pu$ | $^{240}Pu$ | $^{241}Pu$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Comp. 8** | 2.2E12 | 4.2E12 | 3.2E10 | 1.7E7 | 2.5E10 | 6.7E9 | 1.5E12 | 1.3E10 | 1.8E7 | 1.2E8 | 8.0E7 | 2.2E7 | 5.0E7 | 5.4E9 |
| **Comp. 21/2** | 2.1E12 | 4.1E12 | 3.9E10 | 1.7E7 | 2.4E10 | 8.4E9 | 1.9E12 | 1.6E10 | 1.7E7 | 1.2E8 | 7.9E7 | 2.2E7 | 4.9E7 | 5.4E9 |

**RELEVANT COMMENTS**

[1] At the time of waste production
[2] Radionuclides used as scaling factor in evaluation of other nuclides

## Table L-17 Quantity and characteristics of waste stored in building 157/1, compartments 16 and 17 at 01/03/2008

| | | | |
|---|---|---|---|
| **FACILITY STATUS** | **Comp. 16** | **Comp. 17** | |
| | Full 8/1999 | In operation | |
| **AVERAGE** | **Comp. 16** | **Comp. 17** | |
| **WASTE AGE** | 6.4 y | - | |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** |
| **CLASSIFICATION** | Group 2 | Non-combustible | In bulk |
| | **Comp. 16** | **Comp. 17** | **Annual Arising** |
| **WASTE VOLUME** | 1160 $m^3$ | 615 $m^3$ | 56 $m^3$ |
| **WASTE MASS** | 672 tons | 342 tons | ~30 tons |

| **PHYSICAL COMPOSITION** | **Combustible** | | | | | **Non-combustible** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| **(In % vol.)** | No | No | No | No | No | 50 – 70% | 20% | 20 – 25% | Yes [2] | No | No | Yes[1] |

| | | | | | |
|---|---|---|---|---|---|
| **GENERAL** | | **Total Activity** | **Specific Activity** | | **Surface Dose Rate** [3] |
| **RADIOLOGICAL** | Comp. 16 | 2.58E12 Bq | 5.59E9 Bq/t | 2.88E9 Bq/$m^3$ | 0.3 – 10 mSv/h |
| **PROPERTIES** | Comp. 17 | - | - | - | 0.3 – 10 mSv/h |

| **RADIONUCLIDE COMPOSITION** | $^{60}Co$ [4] | $^{137}Cs$ [4] | $^{14}C$ | $^{244}Cm$ | $^{90}Sr$ | $^{59}Ni$ | $^{63}Ni$ | $^{94}Nb$ | $^{129}I$ | $^{241}Am$ | $^{238}Pu$ | $^{239}Pu$ | $^{240}Pu$ | $^{241}Pu$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Comp. 16** | 2.3E11 | 2.2E12 | 2.5E9 | 9.2E6 | 1.3E10 | 5.4E8 | 1.2E11 | 1.0E9 | 8.9E6 | 6.1E7 | 4.1E7 | 1.1E7 | 2.5E7 | 3.0E9 |

| | |
|---|---|
| **RELEVANT COMMENTS** | [1] Spent Sealed Sources: Compartment 16<br>[2] For radionuclide properties of graphite, see Chapter 8.1<br>[3] At the time of waste production<br>[4] Radionuclides used as scaling factor in evaluation of other nuclides |

## Table L-18 Quantity and characteristics of waste stored in building 157/1 Compartments 18 – 20/2 at 01.03.2008

| | | | |
|---|---|---|---|
| **FACILITY STATUS** | **Comp. 18/2** | **Comp. 19/2** | **Comp. 20/2** |
| | Full (3/2004) | In operation | Empty |
| **AVERAGE** | **Comp. 18/2** | **Comp. 19/2** | **Comp. 20/2** |
| **WASTE AGE** | 1.8 y | - | - |
| **WASTE** | **Radiological** | **Physical** | **Waste Form** |
| **CLASSIFICATION** | Group 2 | Combustible | In bulk |

| | **Comp. 18/2** | **Comp. 19/2** | **Comp. 20/2** | **Annual Arising** | **Comments** |
|---|---|---|---|---|---|
| **WASTE VOLUME** | 380 $m^3$ | 200 $m^3$ | - | 75 $m^3$ | Note that also compartment 8 is in operation |
| **WASTE MASS** | 87 tons | 49 tons | - | ~20 tons | for storage of Group 2 combustible waste |

| | **Combustible** | | | | | **Non-combustible** | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PHYSICAL COMPOSITION** | **Cloth** | **Wood** | **Filters** | **PVC** | **Other** | **Metal** | **Construction Materials** | **Thermal Insulation** | **Graphite** | **Cables, Casings** | **Sediments** | **Other** |
| **(In % vol.)** | 35-45 % | 5-10 % | 10 – 15 % | 15 – 20 % | 15% | No | No | No | No | No | No | No |

| | | | | |
|---|---|---|---|---|
| **GENERAL RADIOLOGICAL** | **Total Activity** | **Specific Activity** | | **Surface Dose Rate [1]** |
| **PROPERTIES** | 1.53E12 Bq | 2.49E10 Bq/t | 5.98E9 Bq/$m^3$ | 0.3 – 10 mSv/h |

| **RADIONUCLIDE COMPOSITION** | $^{60}$Co [2] | $^{137}$Cs [2] | $^{14}$C | $^{244}$Cm | $^{90}$Sr | $^{59}$Ni | $^{63}$Ni | $^{94}$Nb | $^{129}$I | $^{241}$Am | $^{238}$Pu | $^{239}$Pu | $^{240}$Pu | $^{241}$Pu |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Comp. 18/2** | 1.1E12 | 6.4E10 | 6.7E9 | 2.9E5 | 3.8E8 | 1.4E9 | 3.4E11 | 2.7E9 | 2.3E5 | 1.6E6 | 1.1E6 | 2.9E5 | 6.7E5 | 9.8E7 |

| | |
|---|---|
| **RELEVANT COMMENTS** | [1] At the time of waste production<br>[2] Radionuclides used as scaling factor in evaluation of other nuclides |

**Table L-19 Quantity and characteristics of waste stored in building 157/1, compartments 18 – 21/1 and 19 – 21/3 at 01.03.2008**

| FACILITY STATUS | Comp. 18/1 | Comp. 19/1 | Comp. 20/1 | Comp. 21/1 | Comp. 19/3 | Comp. 20/3 | Comp. 21/3 |
|---|---|---|---|---|---|---|---|
| | Full (9/2000) | Full (12/2002) | Full (4/2007) | In operation | In operation | Empty | Empty |

| AVERAGE WASTE AGE | Comp. 18/1 | Comp. 19/1 | Comp. 20/1 | Comp. 21/1 | Comp. 19/3 | Comp. 20/3 | Comp. 21/3 |
|---|---|---|---|---|---|---|---|
| | 2.1 y | - | - | 1.7 y | - | - | - |

| WASTE CLASSIFICATION | Radiological | Physical | Waste Form |
|---|---|---|---|
| | Group 1 | Combustible | **Bulk in plastic bags, in comp. 21/1 bales [1]** |

| | Comp. 18/1 | Comp. 19/1 | Comp. 20/1 | Comp. 21/1 | Comp. 19/3 | Comp. 20/3 | Comp. 21/3 | Annual Arising |
|---|---|---|---|---|---|---|---|---|
| WASTE VOLUME | 380 $m^3$ | 390 $m^3$ | 390 $m^3$ | 262 $m^3$ | 60 $m^3$ | - | - | 250 $m^3$ |
| WASTE MASS | 93 tons | 112 tons | 139 tons | 135 tons | 20 tons | - | - | ~80 tons |

| PHYSICAL COMPOSITION | Combustible | | | | | Non-combustible | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cloth | Wood | Filters | PVC | Other | Metal | Construction Materials | Thermal Insulation | Graphite | Cables, Casings | Sediments | Other |
| (In % vol.) | 40 – 50% | 10-15% | 15 – 20% | 10-15% | 5-10% | No | No | No | No | No | No | No |

| GENERAL RADIOLOGICAL PROPERTIES | | Total Activity | Specific Activity | | Surface Dose Rate [2] |
|---|---|---|---|---|---|
| | Comp. 18/1 | 5.55E9 Bq | 5.96E7 Bq/t | 1.46E7 Bq/$m^3$ | <0.3 mSv/h |
| | Comp. 19/1 | - | - | - | <0.3 mSv/h |
| | Comp. 21/1 | 1.89E10 Bq | 2.58E8 Bq/t | 1.51E8 Bq/$m^3$ | <0.3 mSv/h |

| RADIONUCLIDE COMPOSITION | $^{60}Co$ [3] | $^{137}Cs$ [3] | $^{14}C$ | $^{244}Cm$ | $^{90}Sr$ | $^{59}Ni$ | $^{63}Ni$ | $^{94}Nb$ | $^{129}I$ | $^{241}Am$ | $^{238}Pu$ | $^{239}Pu$ | $^{240}Pu$ | $^{241}Pu$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Comp. 18/1 | 4.0E9 | 2.1E8 | 2.5E7 | 9.4E2 | 1.3E6 | 5.3E6 | 1.3E9 | 1.0E7 | 7.8E2 | 5.3 E3 | 3.7E3 | 9.7E2 | 2.2E3 | 3.2E5 |
| Comp. 19/1 | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Comp. 21/1 | 1.3E10 | 1.3E9 | 7.9E7 | 6.4E3 | 8.3E6 | 1.7E7 | 4.0E9 | 3.2E7 | 4.8E3 | 3.3E4 | 2.3E4 | 6.1E3 | 1.4E4 | 2.2E6 |

**RELEVANT COMMENTS**

[1] 126 pieces of bales and 30 $m^3$ of bulk waste (bulk waste not included in radiological inventory)
[2] At the time of waste production
[3] Radionuclides used as scaling factor in evaluation of other nuclides

**Table L-20, Characteristics of the waste in building 158 (Bituminised waste)**

| Canyon (cell) | UF44B01 | | UF44B02 | | UF59B01 | |
|---|---|---|---|---|---|---|
| Group of waste | | | | | | |
| Type of waste | combustible | | combustible | | combustible | |
| Waste form | bitumen compound | | bitumen compound | | bitumen compound | |
| Compartment's volume, $m^3$ | 2500.0 | | 2500.0 | | 1000.0 | |
| Waste volume, $m^3$ | 1957.7 | | 2050.8 | | 784.3 | |
| Canyon's occupation, % | 78.3 | | 82.0 | | 78.4 | |
| Waste mass, kg | 2349000 | | 2461000 | | 941000 | |
| Mass of salts in bitumen compound, kg | 824000 | | 912000 | | 324000 | |
| Date of the first waste load | Aug-1987 | | Apr-1989 | | May-1991 | |
| Date of the last waste load | Mar-1989 | | Oct-1990 | | Dec-1991 | |
| Compartment status | closed | | closed | | closed | |
| Date for presented activity data | 01-Nov-1999 | | 01-Nov-1999 | | 01-Nov-1999 | |
| | Accumulated activity, Bq | Remain activity, Bq | Accumulated activity, Bq | Remain activity, Bq | Accumulated activity, Bq | Remain activity, Bq |
| Cr – 51 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mn – 54 | 0 | 0 | 0 | 0 | 1,11E+09 | 2,22E+6 |
| Fe – 59 | 1,85E+09 | 1,48E1-18 | 6,85E+10 | 3,7·E-13 | 2,59E+09 | 3,7E-11 |
| Co – 60 | 2,74E+11 | 6,18E+10 | 2,45E+11 | 7,03E+10 | 1,58E+11 | 5,37E+10 |
| I – 131 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cs – 134 | 4,71E+12 | 1,08E+11 | 6,14E+12 | 2,36E+11 | 1,75E+12 | 1,15E+11 |
| Cs – 137 | 4,11E+12 | 3,16E+12 | 2,9E+12 | 2,31E+12 | 1,65E+12 | 1,37E+12 |
| Total activity, Bq | 9,43E+12 | 3,33E+12 | 9,35E+12 | 2,62E+12 | 3,56E+12 | 1,54E+12 |

**Continuation of L-20, Characteristics of the waste in building 158**

| Canyon (cell) | UF44B03 | | UF44B04 | | UF45B01 | |
|---|---|---|---|---|---|---|
| Group of waste | | | | | | |
| Type of waste | combustible | | combustible | | combustible | |
| Waste form | bitumen compound | | bitumen compound | | bitumen compound | |
| Compartment's volume, $m^3$ | 2500.0 | | 2500.0 | | 2500.0 | |
| Waste volume, $m^3$ | 1963.8 | | 1743.5 | | 2002 | |
| Canyon's occupation, % | 78.6 | | 69.7 | | 80 | |
| Waste mass, kg | 2357000 | | 2092000 | | 2402400 | |
| Mass of salts in bitumen compound, kg | 825000 | | 711000 | | 890000 | |
| Date of the first waste load | Jan-1992 | | Jul-1994 | | Sep-1996 | |
| Date of the last waste load | Jun-1994 | | Jul-1996 | | Apr-2004 | |
| Compartment status | closed | | closed | | closed | |
| Date for presented activity data | 01-Nov-1999 | | 01-Nov-1999 | | 01-Nov-1999 | |
| | Accumulated activity, Bq | Remain activity, Bq | Accumulated activity, Bq | Remain activity, Bq | Accumulated activity, Bq | Remain activity, Bq |
| Cr - 51 | 0 | 0 | 0 | 0 | 3,7E+11 | 3,49E+11 |
| Mn – 54 | 3,55E+09 | 2,7E+07 | 9,1E+09 | 4E+07 | 6,36E+10 | 2,63E+10 |
| Fe – 59 | 0 | 0 | 0 | 0 | 0 | 0 |
| Co – 60 | 4,51E+11 | 2,02E+11 | 2,29E+11 | 1,31E+11 | 1,59E+11 | 1,42E+11 |
| I – 131 | 0 | 0 | 0 | 0 | 6,44E+11 | 5,25E+11 |
| Cs – 134 | 3,24E+12 | 4,07E+11 | 2,75E+12 | 6,85E+11 | 2,66E+12 | 2E+12 |
| Cs – 137 | 6,22E+12 | 5,35E+12 | 6,44E+12 | 5,85E+12 | 6,89E+12 | 6,75E+12 |
| Total activity, Bq | 9,91E+12 | 5,98E+12 | 9,43E+12 | 6,67E+12 | 1,08E+13 | 9,78E+12 |

**Continuation of L- 20, Characteristics of the waste in building 158**

| Canyon (cell) | UF45B02 | | UF59B03 | |
|---|---|---|---|---|
| Group of waste | | | | |
| Type of waste | combustible | | combustible | |
| Waste form | bitumen compound | | bitumen compound | |
| Compartment's volume, $m^3$ | 2500.0 | | 2500.0 | |
| Waste volume, $m^3$ | 1862 | | 448 | |
| Canyon's occupation, % | 75 | | 18 | |
| Waste mass, kg | 2234400 | | 537600 | |
| Mass of salts in bitumen compound, kg | 633000 | | 152300 | |
| Date of the first waste load | May-2001 | | Feb-2007 | |
| Date of the last waste load | Nov -2007 | | - | |
| Compartment status | closed | | in operation | |
| Date for presented activity data | Dec-2006 | | Jan-2008 | |
| | Accumulated activity, Bq | Remain activity, Bq | Accumulated activity, Bq | Remain activity, Bq |
| Cs – 134 | 1,07E+13 | 1,07E+13 | 2,11E+12 | 2,11E+12 |
| Cs – 137 | 2,44E+13 | 2,44E+13 | 8,73E+12 | 8,73E+12 |
| Co – 60 | 3,61E+11 | 3,61E+11 | 3,89E+11 | 3,89E+11 |
| Cr – 51 | 2,89E+11 | 2,89E+11 | 1,14E+13 | 1,14E+13 |
| Mn – 54 | 1,08E+11 | 1,08E+11 | 3,7E+11 | 3,7E+11 |
| I – 131 | 4,72E+12 | 4,72E+12 | 4,81E+11 | 4,81E+11 |
| Nb – 95 | 2,97E+11 | 2,97E+11 | - | - |
| Cs – 136 | 1,52E+11 | 1,52E+11 | 1,52E+08 | 1,52E+08 |
| I – 132 | 1,11E+11 | 1,11E+11 | - | - |
| Co – 58 | 1,85E+10 | 1,85E+10 | - | - |
| Mo – 99 | 1,11E+11 | 1,11E+11 | - | - |
| Na-24 | 1,22E+10 | 1,22E+10 | - | - |
| Zr – 95 | 1,78E+11 | 1,78E+11 | - | - |
| I – 133 | 2,11E+10 | 2,11E+10 | - | - |
| Total activity, Bq | 4,15E+13 | 4,15E+13 | 2,35E+13 | 2,35E+13 |

**Table L-21**
**Radioactive waste composition of the liquid waste range of nuclide specific activity concentration in the tanks TW18B01, TW18B02, TW11B03**

| Nuclide | Activity Concentration (Bq / kg) | | | |
|---|---|---|---|---|
| | TW18 B01/TW11B03 | | TW18 B02 | |
| | Dry | Wet | Dry | Wet |
| Mn-54 | 1.8E+8 - 1.9E+8 | 4.8E+7 - 5.9E+7 | 8.1E+6 - 1.3E+7 | 4.1E+6 - 5.6E+6 |
| Co-58 | 1.5E+6 - 2.1E+6 | 4.8E+5 - 5.2E+5 | 1.3E+6 | 5.9E+5 |
| Fe-59 | 6.7E+6 - 1.8E+7 | 5.9E+6 - 2.3E+6 | 4.4E+5 | 2.3E+5 - 3.3E+5 |
| Co-60 | 2.8E+7 - 2.7E+8 | 8.5E+8 - 7.0E+7 | 1.1E+7 | 5.2E+6 |
| Nb-95 | 5.6E+5 - 2.6E+6 | 4.8E+5 - 2.3E+6 | 5.6E+4 - 1.2E+5 | 2.8E+4 - 5.2E+4 |
| Zr-95 | 2.8E+6 | 9.3E+5 | | |
| Cs-134 | 2.0E+7 - 2.1E+7 | 5.6E+6 - 6.3E+6 | 4.8E+5 | 2.2E+6 |
| Cs-137 | 7.0E+7 | 1.9E+7 - 2.3E+7 | 3.4E+6 | 1.7E+6 |
| Total activity | 5.6E+8 - 5.8E+8 | 1.4E+8 - 1.8E+8 | 2.8E+7 | 1.3E+7 |

**Table L-22**
**Activity inventory in drums and storage containers for cemented waste in Storage Building 158/2**

| Container | 200 l Drum | | Storage Container, Transport Container | |
|---|---|---|---|---|
| Nuclide | Activity Inventory (Bq) | | | |
| | Maximum | Average | Maximum | Average |
| **Mn-54** | **1.59E+10** | **1.41E+10** | **1,27E+11** | **1,13E+11** |
| **Co-60** | **2.26E+10** | **1.13E+10** | **1,81E+11** | **9,04E+10** |
| **Cs-134** | **1.76E+09** | **1.56E+09** | **1,41E+10** | **1,25E+10** |
| **Cs-137** | **5.85E+09** | **2.66E+09** | **4,68E+10** | **2,13E+10** |
| **Total** | **4,61E+10** | **2,96E+10** | **3,69E+11** | **2,37E+11** |