Implementation of Maišiagala Radioactive Waste Storage Facility Decommissioning Project

Dr. Gintautas Klevinskas

Project Manager

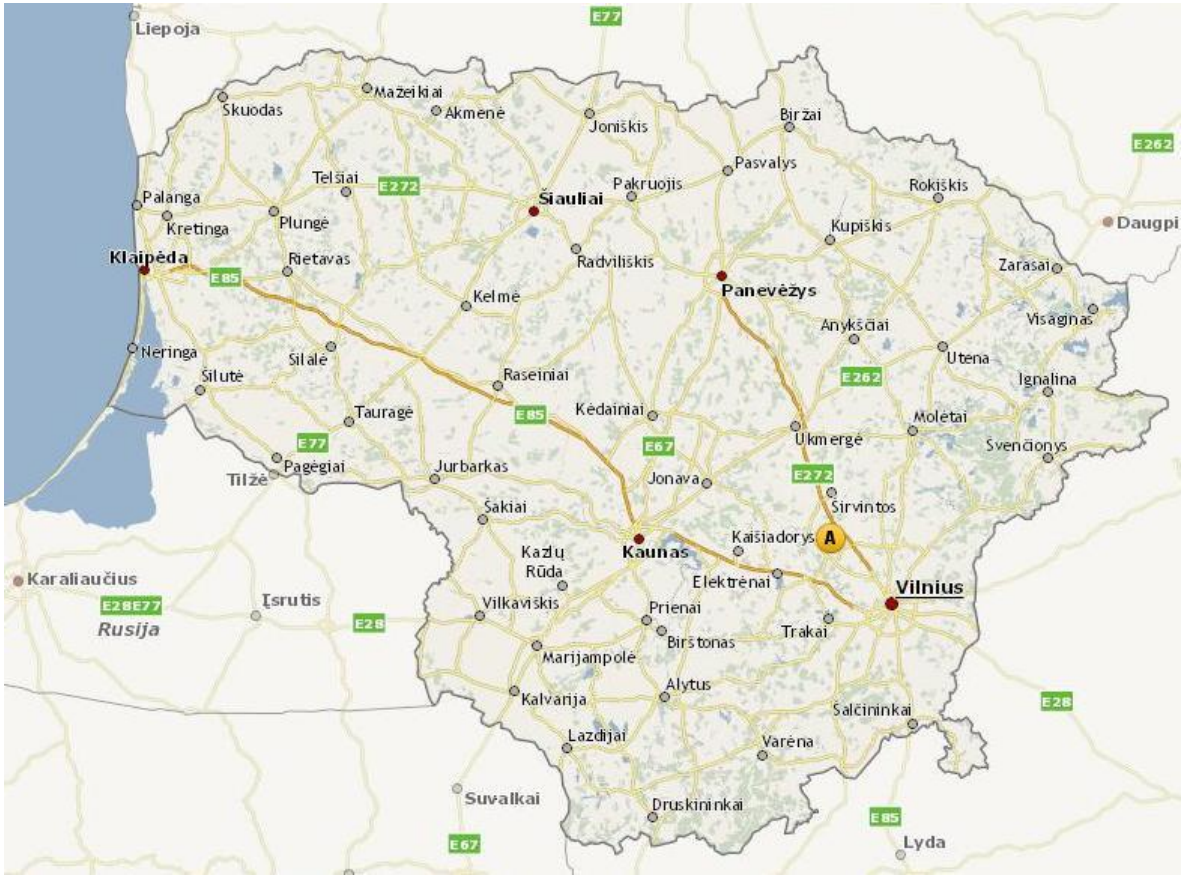
SE Ignalina Nuclear Power Plant, Lithuania

Regional WS on Planning for Decommissioning and Remediation of Old Storage / Disposal Sites,

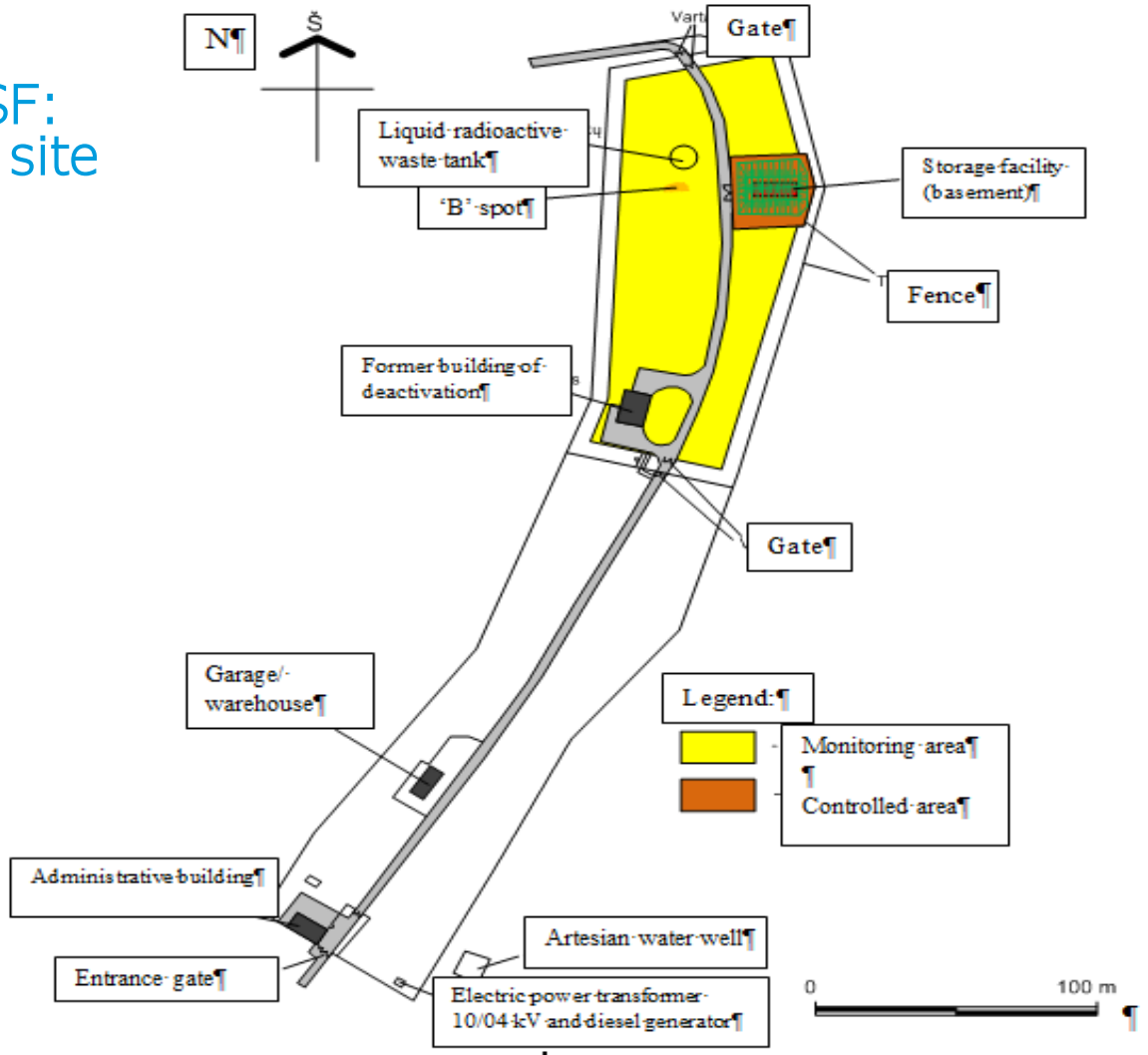
Chisinau, Republic of Moldova, 4-7 July 2023

Maišiagala RWSF: site and location

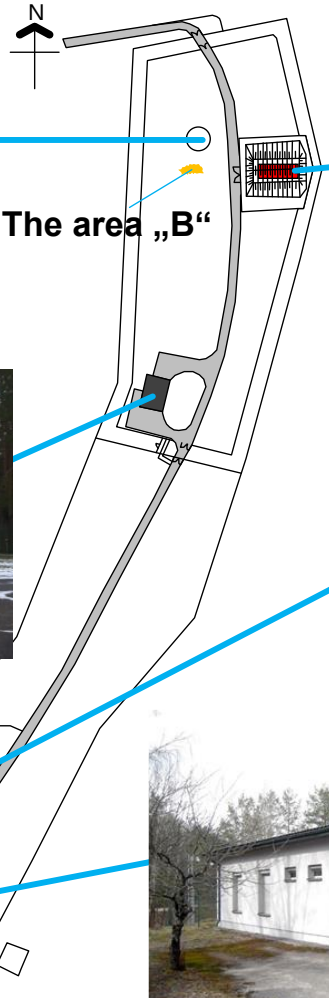
- Located in Širvintai municipality, in Bartkuškis forest, in the 53rd quarter of the Žaliosios forestry, about 7 km north-west of Maišiagala and about 30 km in the same direction from Vilnius
- Operated since 1964
- Closed in 1989



Maišiagala RWSF: facility and the site



The reservoir for the liquid radioactive waste



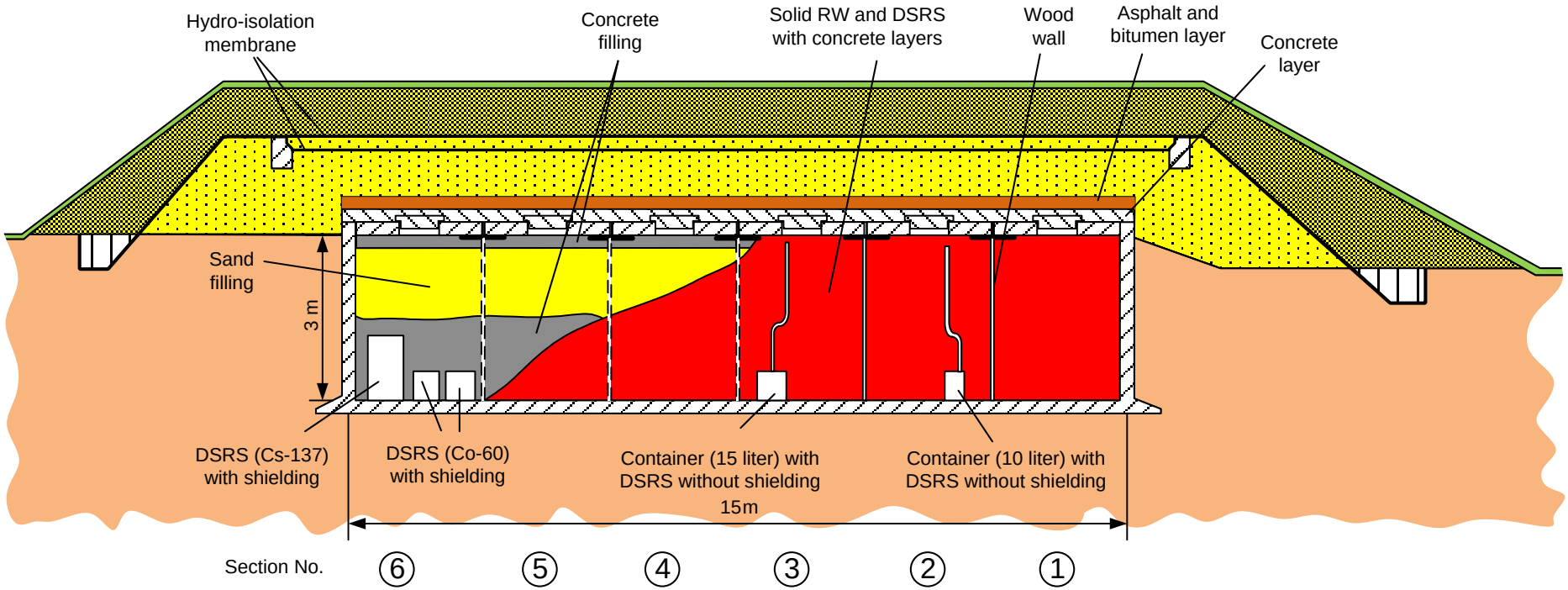
The repository

The former decontamination building

The garage

The administrative building

Maišiagala RWSF: Cross-Section of Vault r1



Typical RADON type RWS with size 5×15×3 m, volume ~ 200 m^3;

RW collected from industrial, medical, military, and scientific research facilities during the period 1964–1989

Upgrading Safety of Maišiagala RWS

2002

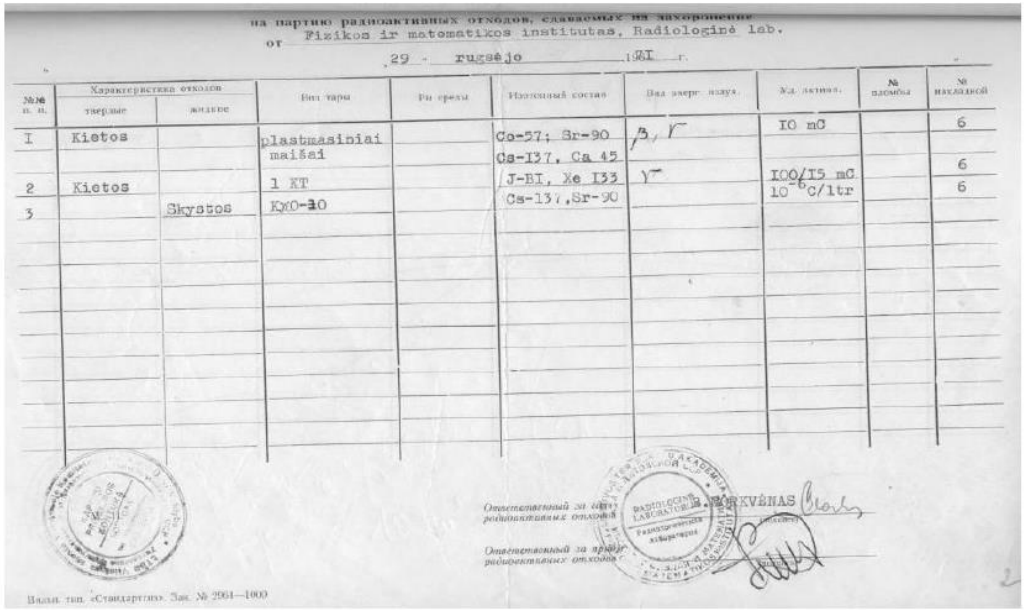
2006

Installation of new protection barriers – membranes - above the vault;

Physical protection system was upgraded (surrounded with a special double fence, motion-sensitive detectors etc.)

Environment monitoring system was upgraded

Data Collection



на партию радиоактивных отходов, сдаваемых на захоронение
от Fizikos ir matematikos institutas, Radiologinė lab.
29 - rugsėjo 19 81 г.

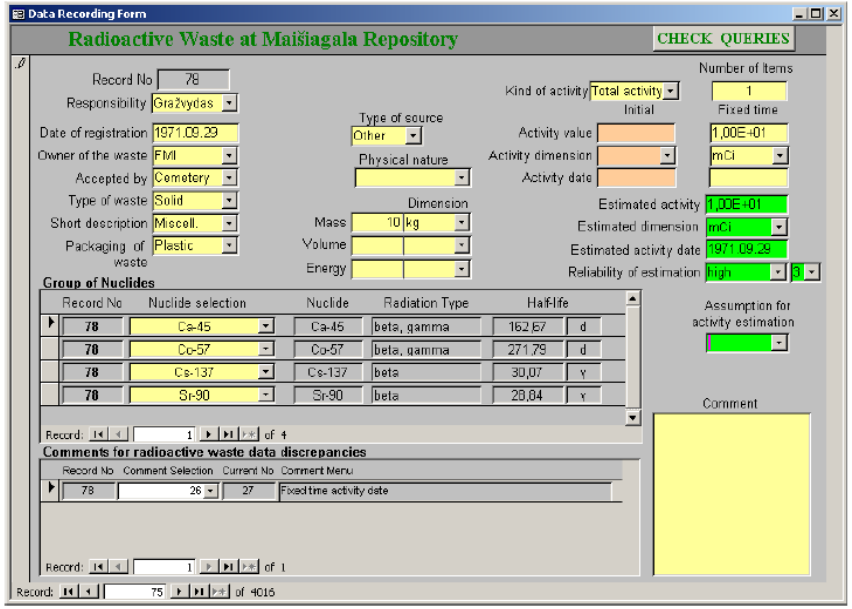
№№ п. п.	Характеристика отходов: твердые	Характеристика отходов: жидкие	Вид тары	Вес брутто	Изотопный состав	Вид энерг. излуч.	Уд. активн.	№ пломбы	№ накладной
I	Kietos		plastmasiniai maišai		Co-57; Sr-90 Cs-137, Ca 45	β, γ	IO mC		6
2	Kietos		1 KT		J-BI, Xe I33 Cs-137, Sr-90	γ	IOO/I5 mC 10^{-6}C/1tr		6
3		Skystos	KXO-30						6

Ответственный за прием радиоактивных отходов

RADIOLOGINĖ LABORATORIJA

Ответственный за прием радиоактивных отходов

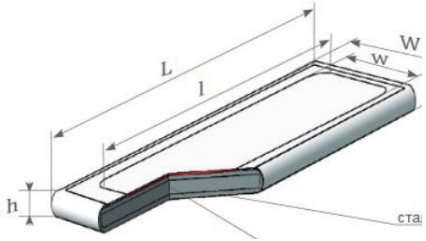
Вилн. тип. «Стандартас». Зак. № 2961—1000



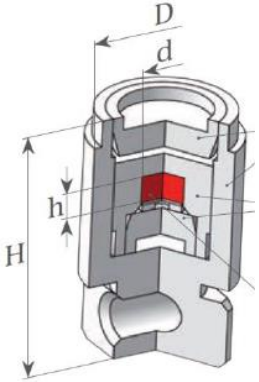
- All information about existing RW at MRWSF is collected in record books – they ALL are preserved.
- In 2005 after deep analysis of the record books, the database of RW inventory was developed.
- Estimated accuracy - ~98-99 percent.

Examples of DSRS at Maišiagala RWSF

Cs-137:
„БГИ-А“ type



Pu-239: neutralizer



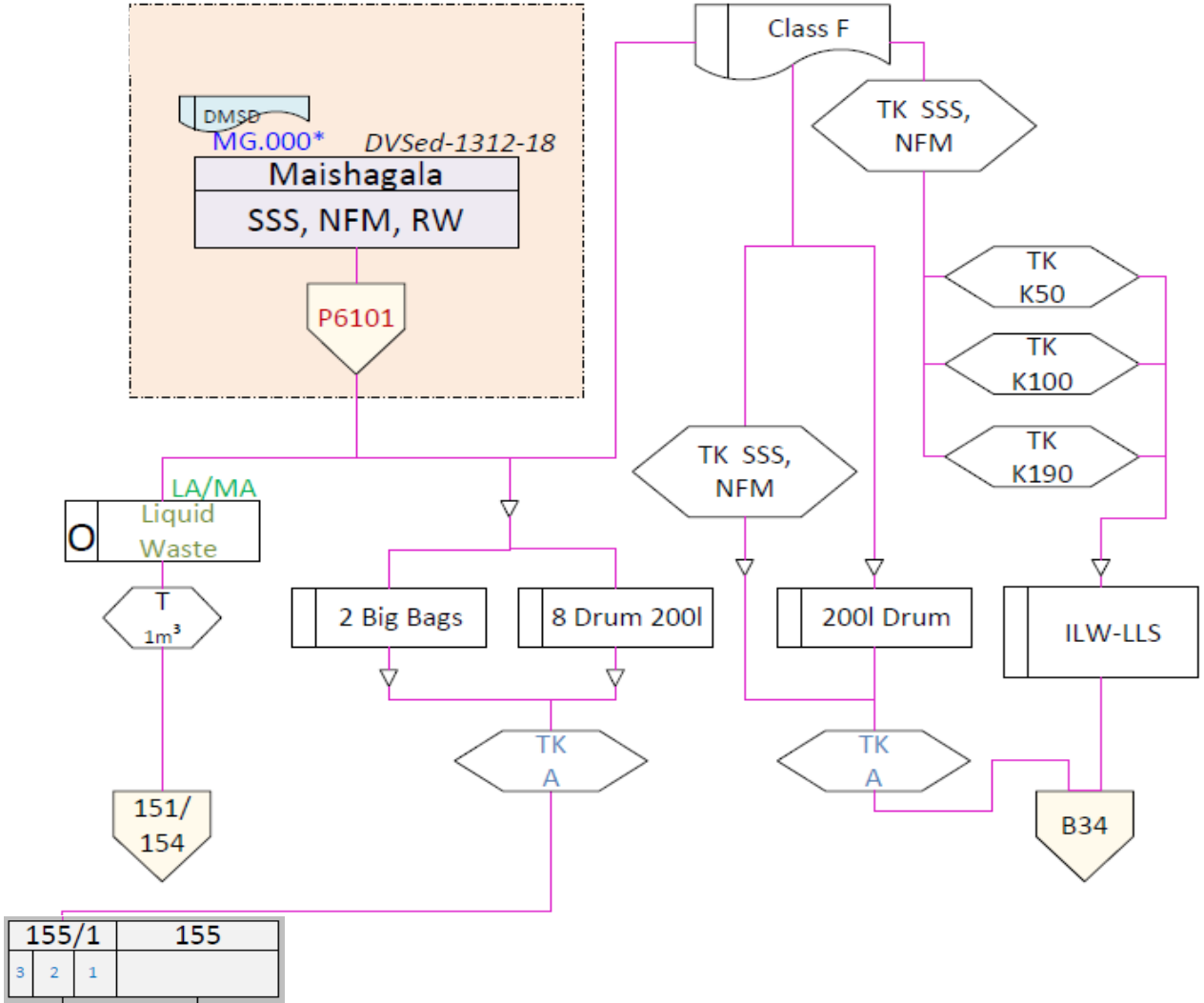
Pu-239/Be sources:
D=15-29 mm, H=24-39 mm

Sr-90:
De-ising sensor

Cs-137:
ЭМ type used in relays ГР-6,
ГР-7 ir ГР-8

Pu-239:
Smoke detectors

Maišiagala RWSF: estimated flow chart routing for treatment and storage of RW at Ignalina NPP



Maišiagala RWSF: Radiological status and other hazards present

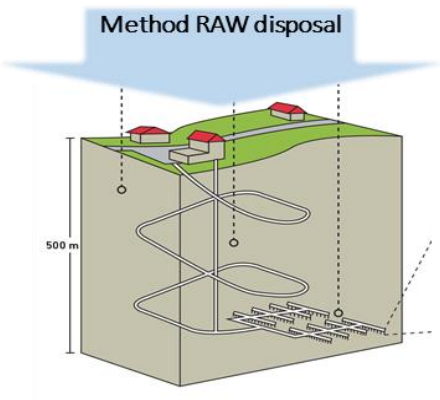
- According to expert assessment, about 114 m^3 of RW could be stored in the vault of the Maišiagala RWSF. The mass of the waste is unknown.
- Total 9872 units of SSS. The database does not assess the condition of the DSRS.
- The database indicates that about 37% of the total activity is accumulated in the DSRS, the remaining 63% of the activity is distributed in other waste.

Radionuclide	T1/2, years	Activity, Bq	Activity, % of total
H-3	12,3	4,8E+13	63%
Cs-137	30,0	2,7E+13	35%
Pu-239/Be	2,41E+04	6,0E+11	0,8%
Pu-239	2,41E+04	3,2E+11	0,4%
Sr-90	29,1	3,0E+11	0,4%
C-14	5,73E+03	1,7E+11	0,2%
Co-60	5,27	1,2E+11	0,2%
Ra-226	1,60E+03	1,0E+11	0,1%
Ni-63	96,0	3,3E+10	0,04%
Eu-152	13,537	1,1E+10	0,01%
Cl-36	3,01E+05	1,2E+09	0,002%
Kr-85	10,7	3,6E+08	< 0,001%
U-238	4,47E+09	4,1E+07	< 0,001%
Tl-204	3,78	7,4E+06	< 0,001%
Pm-147	2,6234	3,1E+06	< 0,001%
Ba-133	10,5	5,3E+05	< 0,001%
Bi-207	38,0	3,4E+05	< 0,001%
Sb-125	2,77	2,6E+05	< 0,001%
Fe-55	2,70	7,3E+04	< 0,001%
Na-22	2,60	3,5E+04	< 0,001%
U-234	2,46E+05	1,4E+03	< 0,001%
Cs-134	2,06	89	< 0,001%
Cd-109	1,27	10	< 0,001%
Ru-106	1,01	0,018	< 0,001%
Ce-144	0,78	0,002	< 0,001%
Total:		7,7E+13	

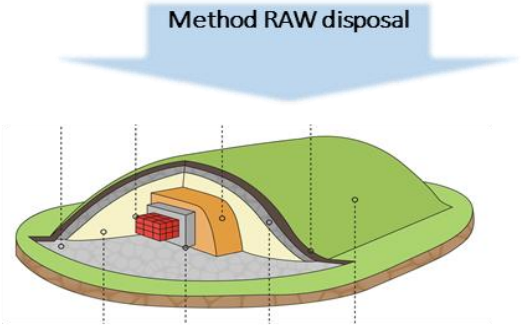
Table. Main Radionuclide Composition and Activity of RW in the Vault of the Maišiagala RWSF as of 1 January 2020

Maišiagala RSWF: Radiological status and other hazards present (continued)

RW with SSS (114 m³)



RW without SSS (190 m³)

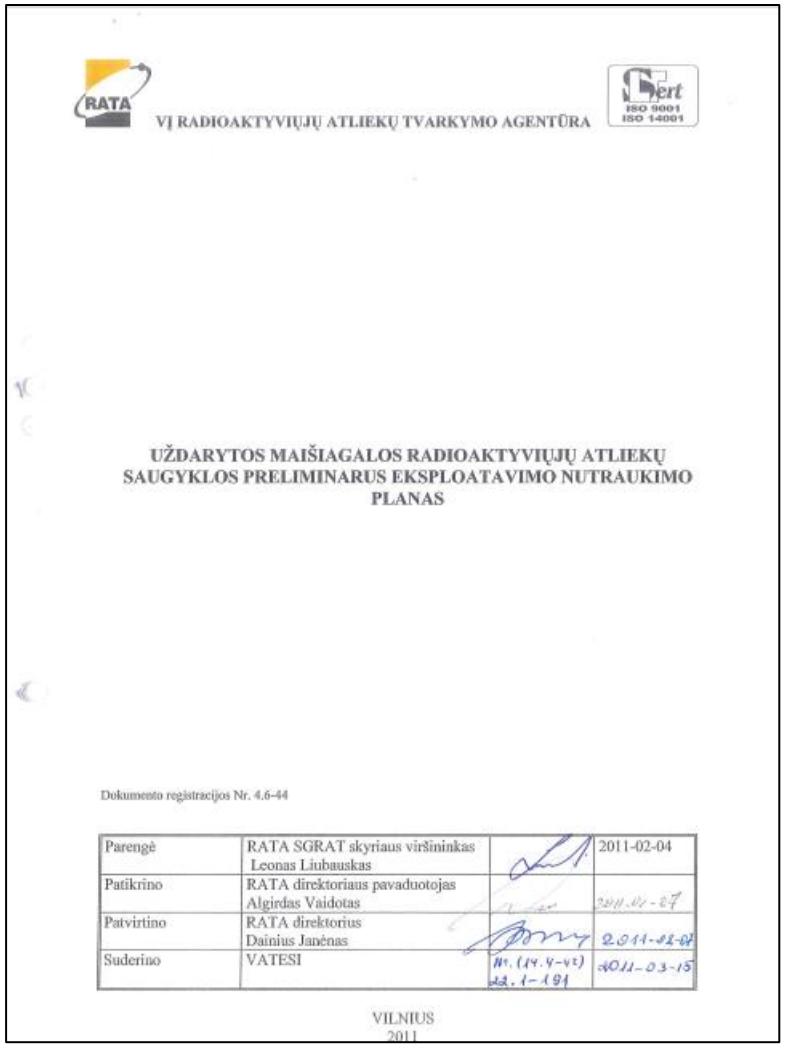


Maišiagala RWSF site contamination review shows that primary radioactive, potentially radioactive and non-radioactive waste will be generated during dismantling and / or decontamination of:

- Maišiagala RWSF vault and retrieval of RAW stored;
- Liquid RAW tank;
- Separate area of contaminated soil at Maišiagala RWSF site, so called "B" spot (Ra-226 radionuclide);
- Former decontamination building (depending on the results of evaluative radiological investigations).

Maišiagala RWSF: Decommissioning Planning

- VATESI license to operate closed Maishiagala RWMS was granted in 2006
- Preliminary Decommissioning Plan for closed MRWS was developed by former RWMA and approved by VATESI on March 15, 2011 according to nuclear safety requirements
- Purpose of the plan - to plan and forecast necessary equipment and technologies, to collect information needed for decommissioning and to estimate necessary costs and funding
- Preliminary Decommissioning Plan shall be reviewed taking into account progress in RW management technologies, experiences and changes in legislation.



VĮ RADIOAKTYVIŲJŲ ATLIEKŲ TVARKYMO AGENTŪRA

UŽDARYTOS MAIŠIAGALOS RADIOAKTYVIŲJŲ ATLIEKŲ SAUGYKLOS PRELIMINARUS EKSPLOATAVIMO NUTRAUKIMO PLANAS

Dokumento registracijos Nr. 4.6-44

Parengė	RATA SGRAT skyriaus viršininkas Leonas Liubauskas		2011-02-04
Patikrino	RATA direktoriaus pavaduotojas Algirdas Vaidotas		2011-02-07
Patvirtino	RATA direktorius Dainius Janėnas		2011-02-07
Suderino	VATESI	Nr. (14.4-V2) 22.1-191	2011-03-15

VILNIUS
2011

Maišiagala RWSF: decommissioning purpose, activities and conditions

Purpose - to manage radioactive waste from MRWSF (Maišiagala radioactive waste storage facility), contaminated with radionuclides soil and constructions and to release the site from radiation control

PROJECT IS FINANCED FROM EU STRUCTURAL FUNDS

Activities:

Infrastructure installment works required to perform demolition works

RW and contaminated soil removal

Transportation of RW and contaminated soil to INPP

Carrying out radiological survey of the territory

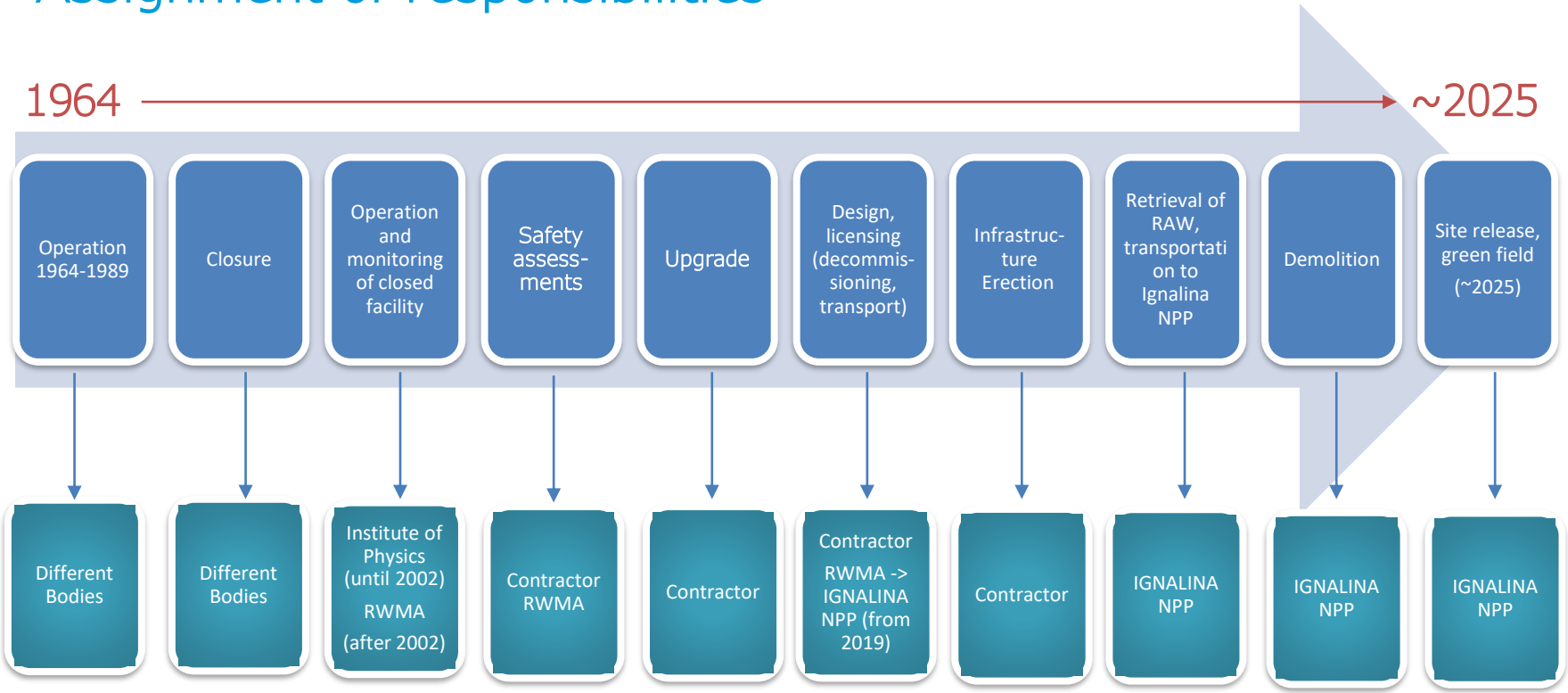
Determination if the territory complies with release levels

Release of the site from radiation control and cancel the NF status

Conditions:

- Environmental impact assessment
- Decommissioning technical and SA documents
- VATESI decommissioning license
- VATESI transportation license

Maišiagala RWSF: from operation up to greenfield. Assignment of responsibilities



Maišiagala RWSF: Environmental Impact Assessment Programme and Report

- During period of 2017-2018 Environmental Impact Assessment Programme and Report were developed and approved by competent authorities

- Planned economical activity ,,Decommissioning of Maishiagala RWSF" *is permissible* considering the time alternative – <u>Immediate Dismantling</u>

- Decision taken by Environmental Protection Agency in the letter No. (30.1)-A4-5363 of June 5, 2018

- EIAP reviewed and approved by:
  - Širvintai district mun. administration
  - VATESI
  - RSC
  - Culture Heritage Department
  - National Public Health Centre under the MoH
  - Fire and Rescue Department
  - Ministry of Energy

Maišiagala RWSF: decommissioning purpose, activities and conditions (cont. 2)

Approved MRWS decommissioning Environmental Impact Assessment

Approved Final MRWS decommissioning plan

Approved MRWS decommissioning General radiological survey program, main radiological survey and assessment is performed

Procured and installed MRWS meteorological station

Approved by VATESI - Analysis of the possible consequences of nuclear and radiological accidents at MRWS

Approved by VATESI Decommissioning project plan

Approved by VATESI Decommissioning safety analysis report

Approved by Ministry of Health and VATESI Plan for Radionuclide Emission Into The Environment

Approved by VATESI Radiation safety program

Approved Demolition project

Approved by RSC, AAA, VATESI and European Commission General Dataset for MRWS decommissioning in accordance with Euratom Treaty Article 37

Approved by VATESI all decommissioning license related documents – license issued on May 13, 2021

Preparation and submission for VATESI approval RW transportation licensing documents (100 % of documents is approved)

Maišiagala RWSF: final decommissioning plan, strategy selection criteria and alternatives

In 2017-2018 period Final Decommissioning Plan was developed and coordinated with state authorities

FDP was approved by the order of the Minister of Energy No. 1-272 October 5, 2018

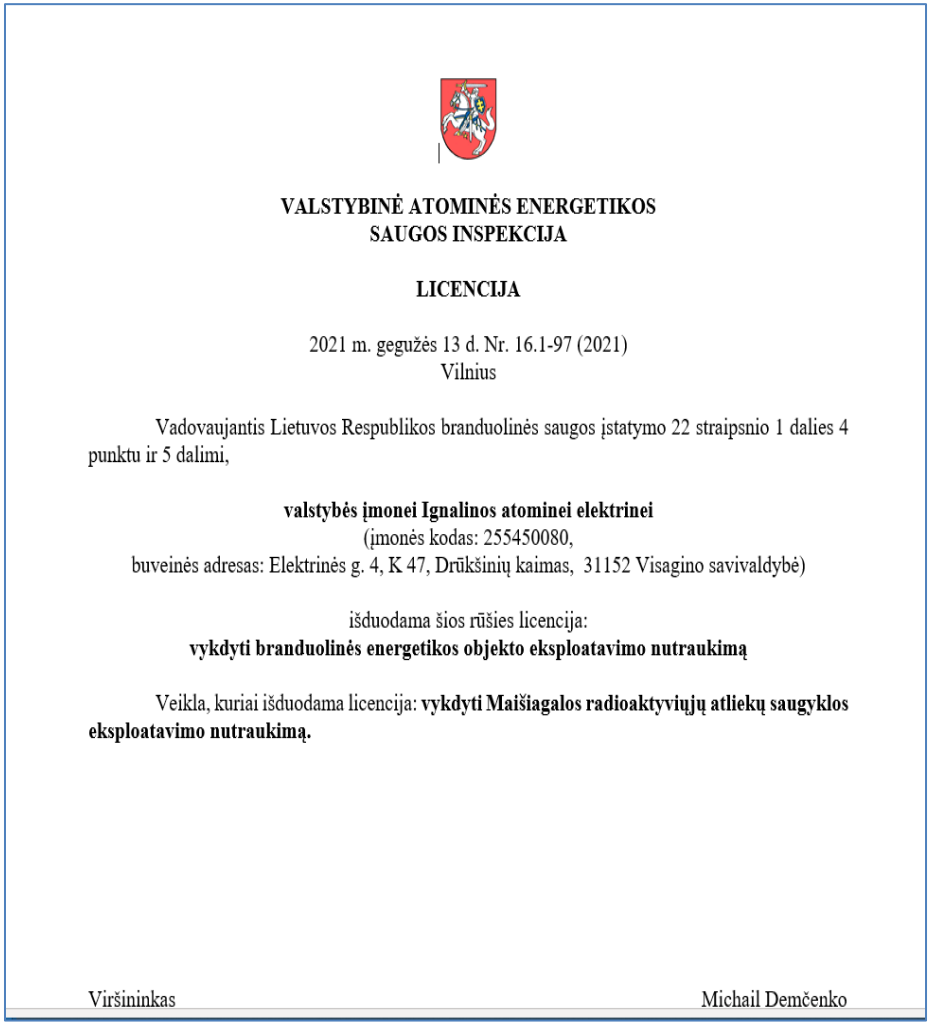
Alternative A1	Alternative A2	Alternative A3
Radiological survey at site is not carried out and clearance is not carried out	Clearance is carried out at site but radiological survey is not performed	Clearance is carried out at site, radiological survey is performed for constructions and soil

Based of Final Decom Plan, further and detailed arrangements were outlined in Decommissioning Project Description

Criterion	Lower level criterion
C1 Waste strams	C1.1 Ratio of primary waste
	C1.2 Amounts of secondary waste
C2 Economical	C2.1 Initial investments
	C2.2 Total expenditures
C3 Duration	C3.1 Project implementation timelime
	C3.2 Workforce
C4 Safety	C4.1 Occupational exposure
	C4.2 Risk for unsanctioned intrusion
C5 Technologies	C5.1 Reuse of existing infrastructure
	C5.2 Reliability of processes
C6 Environmental	C6.1 Radiological impact to the public
	C6.2 Necessary resources
	C6.3 Local impact

Licensing

- On 13 May 2021-05-13 VATESI granted the license No. 16.1-97(2021) to perform decommissioning activities at Maišiagala site
- Transportation license documents are 100 percent approved by VATESI
- Construction permits for ,,caisson“ and other buildings were also granted in April 2021



VALSTYBINĖ ATOMINĖS ENERGETIKOS SAUGOS INSPEKCIJA

LICENCIJA

2021 m. gegužės 13 d. Nr. 16.1-97 (2021)
Vilnius

Vadovaujantis Lietuvos Respublikos branduolinės saugos įstatymo 22 straipsnio 1 dalies 4 punktu ir 5 dalimi,

valstybės įmonei Ignalinos atominei elektrinei
(įmonės kodas: 255450080,
buveinės adresas: Elektrinės g. 4, K 47, Drūkšinių kaimas, 31152 Visagino savivaldybė)

išduodama šios rūšies licencija:
vykdyti branduolinės energetikos objekto eksploatavimo nutraukimą

Veikla, kuriai išduodama licencija: **vykdyti Maišiagalos radioaktyviųjų atliekų saugyklos eksploatavimo nutraukimą.**

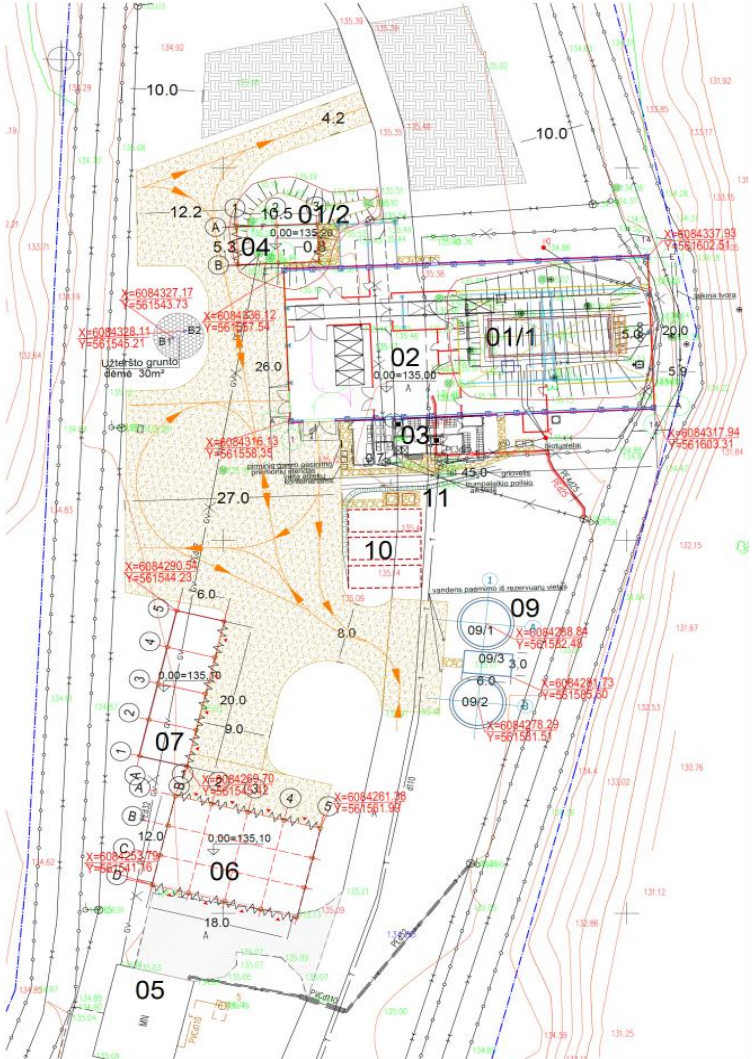
Viršininkas Michail Demčenko

Maišiagala RWSF: demolition project solutions –construction site plan*

Number of temporary buildings erected at Maišiagala RWSF for safe demolition of the RW vaults (main of them - ,,caisson“ with primary containment).

Construction works and engineering design services (Detailed design preparation) **was performed by contractor** chosen through public procurement procedures (ongoing)

*Solutions – according to Demolition project



RW retrieval from Maišiagala RWSF vault, liquid RW vault demolition, territory recultivation, and RW transportation to INPP – **INPP is planning to perform these activities by means of its own capacities**

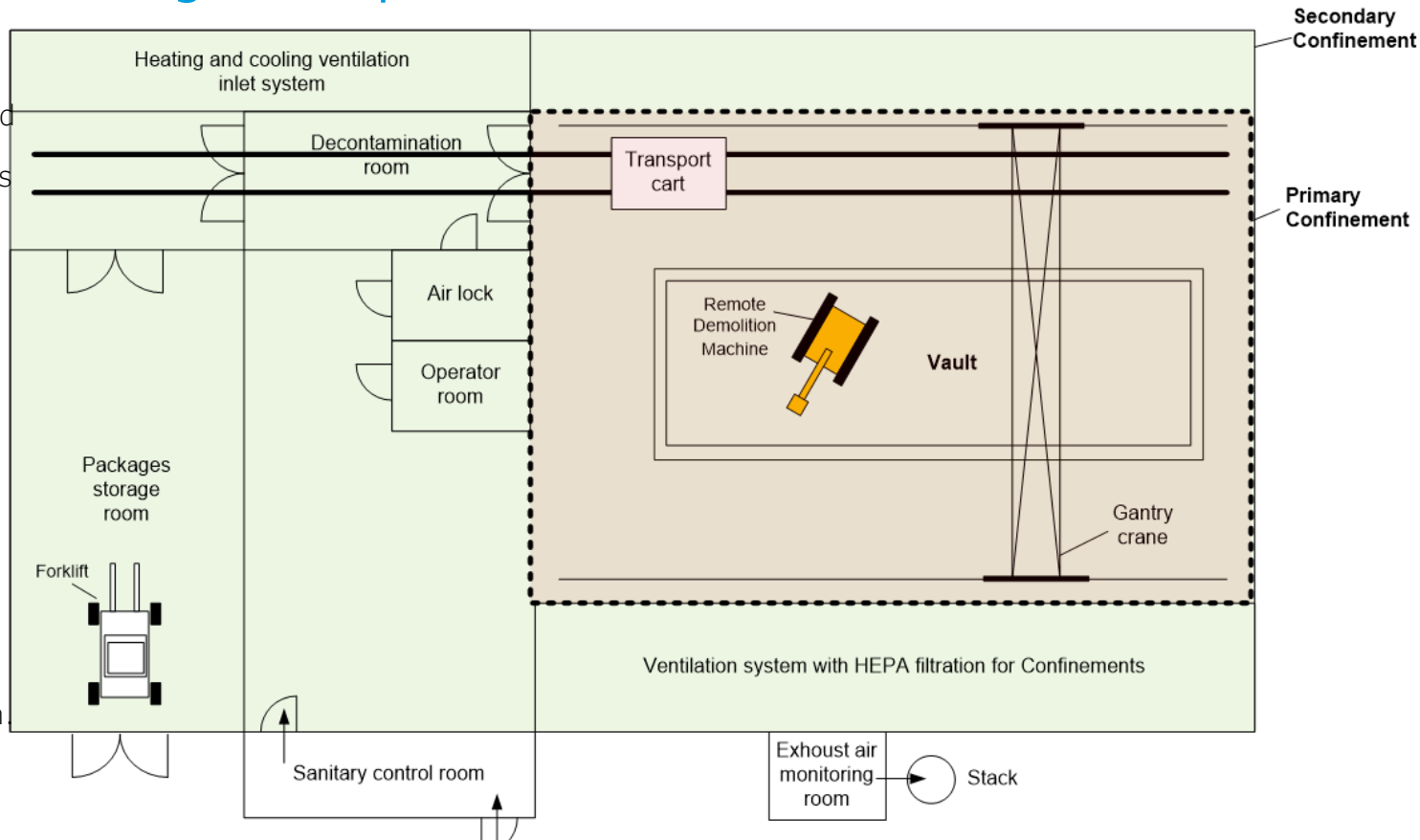
All equipment and means for decommissioning were also acquired by public procurement procedures

Simplified layout of Maishiagala RWS decommissioning concept

Two protection confinements (primary and secondary (,,caisson") made from light structures

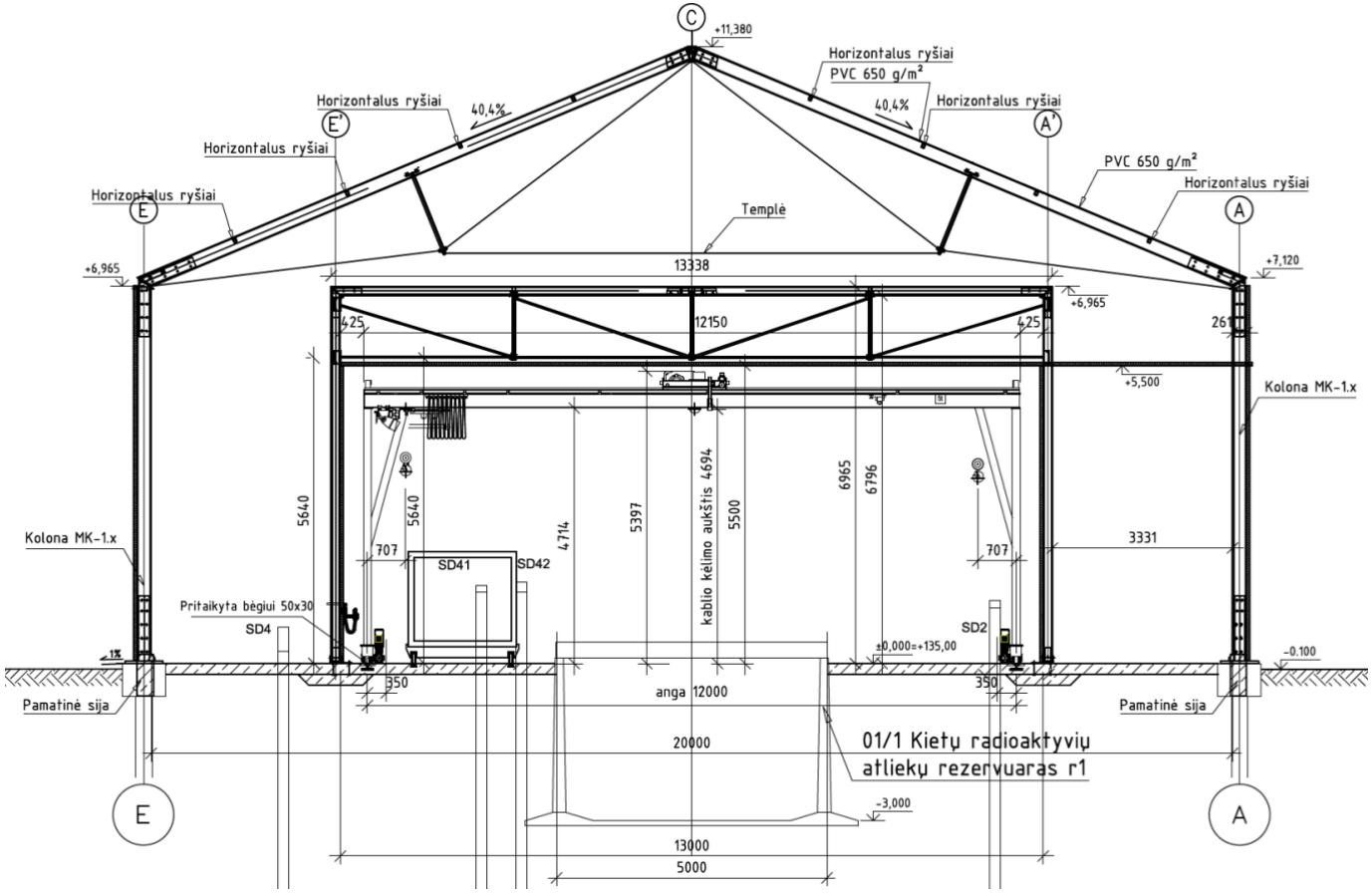
Main technological systems:

- Radiation monitoring (control) system;
- RW retrieval and transportation system
- Ventilation system;
- Packaging;
- Fire safety system;
- Power supply system;
- Compressed air system.



Maišiagala RWSF: Demolition project solutions – caisson cross-section*

IGNALINA NUCLEAR POWER PLANT



*Solutions – according to Demolition project

Maišiagala RWSF: demolition project solutions Equipment


2

3


4


5


6.

1. Demolition remotely controlled robot, 2. multifunctional grippers, 3. concrete shredder, 4. vacuum pump, 5. FIBC, 6. mobile filtering device, 7. 210 l drum

Radiological Impact: General Public

- Maišiagala site is in a remote location:
  - There are no permanent inhabitants in the distance of more than 2 km around the site
  - Occasional public visitors pass the forest surrounding the site
- Three representative groups:
  - Occasional visitors in the forest near the site;
  - Permanent residents living at the distance of 2 km from the Maišiagala site;
  - Person which lives or may stay close to the waste transport road.
- Two age groups*:
  - Adult (> 17 a);
  - Child (1-2 a).

Exposure			Representative groups and persons				
			1st		2nd		3rd
Pathway	Location	Type	Adult	Child	Adult	Child	Adult
Airborne release into the environment	At the fence of the Maišiagala site	External	+		+		
		Inhalation	+		+		
		Ingestion	+	+	+	+	
	At the nearest resident location	External			+	+	
		Inhalation			+	+	
		Ingestion			+	+	
Direct and scattered radiation	At the fence of the Maišiagala site	External	+		+		
	At the RW transport road						+

3. IAEA. "Generic Models for Use in Assessing the Impact of Discharges of Radioactive Substances to the Environment", Safety Reports Series No. 19, Vienna, 2001.

Radiological Impact: Assessment of Doses

- Maišiagala site is in a remote location:
  - There are no permanent inhabitants in the distance of more than 2 km around the site
  - Occasional public visitors pass the forest surrounding the site
- Three representative groups:
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Pathway	Location	Type	Adult	Child	Adult	Child	Adult
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		Inhalation	+		+		
		Ingestion	+	+	+	+	
	At the nearest resident location	External			+	+	
		Inhalation			+	+	
		Ingestion			+	+	
Direct and scattered radiation	At the fence of the Maišiagala site	External	+		+		
	At the RW transport road						+

3. IAEA. "Generic Models for Use in Assessing the Impact of Discharges of Radioactive Substances to the Environment", Safety Reports Series No. 19, Vienna, 2001.

Radiological Impact: Conclusions

- The decommissioning will lead to release of Rn-222 and radioactive aerosols into the environment;
- The dose assessment is based on the IAEA and UNSCEAR recommended models;
- Low radiological impact to the population is expected under normal operation conditions, annual effective dose < 10 μSv.

Transportation options incl. DSSS in cement matrix (except separated DSSS)

or

210 l drums

FIBC (soil, bulk material)

IP-1, IP-2 type (for liquid RW)

Overpack – Type A container that is placed into platform, unloaded at Ignalina NPP and returned empty to Maišiagala RWSF

Separated DSSS Transportation

- High activity SSS (Cs-137)
- 10 liters canister with DSSS without shielding
- 15 liters canister with DSSS without shielding
- Neutron Sources (3 pcs)

210 l drums

Type A

Special arrangement
K-100/150 + ILW-LLS containers

Public information, sharing the experience, stakeholders involvement

Ignalinos atominė elektrinė

Paieška

LT

APIE ĮMONĘ | NAUJIENOS | STRUKTŪRA IR KONTAKTAI | TEISINĖ INFORMACIJA | VEIKLA | KORUPCIJOS PREVENCIJA | ADMINISTRACINĖ INFORMACIJA | PASLAUGOS | DUK | NUORODOS

Rasta rezultatų: 42

IAE specialistai dalinosi patirtimi su Vengrijos kolegomis

Pristatyti aktualūs klausimai radioaktyviųjų atliekų tvarkymo srityje

IAE lankėsi delegacija iš Moldovos

IAE atstovai pasidalino teigiama patirtimi

Planuojamas susitikimas su Širvintų rajono savivaldybės gyventojais

Maišiagal os RAS projekto pristatymas visuomenei

Licencija vykdyti Maišiagal os RAS eksploatavimo nutraukimą

Veikla atitinka visus jai keliamus branduolinės, radiacinės ir fizinės saugos reikalavimus

- Apribojimai
- Asmens duomenų apsauga
- Aukcionai
- Dalyvavimas sprendimų priėmime
- ES Ignalinos programa
- Norvegijos finansinis mechanizmas
- Pažintinės ekskursijos
- Paskaitos moksleiviams

Public information

- Public is informed according to obligations of the Law on Nuclear Safety
- Nuclear Safety Requirements BSR-1.1.5-2017 „Rules of Procedure for Public Participation in Decision-making in the Area of Nuclear Energy“ requires to inform public with licensing documents
- Documents and information:
- https://www.iae.lt/en/activity/decommissioning-projects/6101-project.-decommissioning-of-maisiagala-radioactive-waste-storage-facility/422
- Maishiagala EIA Report:
- https://www.iae.lt/veikla/poveikio-aplinkai-vertinimas/85

IGNALINOS ATOMINĖ ELEKTRINĖ

IŠŠŪKIAI ŠIANDIEN. ATSAKOMYBĖ AMŽIAMS

Širvintų gyventojus kviečiame į susitikimą su Ignalinos AE atstovais

Kviečiame Širvintų gyventojus į susitikimą su Ignalinos AE specialistais, kurio metu bus pristatyta tema: „Maišiagalos saugyklos eksploatavimo nutraukimo projektas“.

Susitikimo metu taip pat bus proga daugiau sužinoti apie vykdomus Ignalinos AE eksploatavimo nutraukimo darbus.

Kada? Rugsėjo 9 d. 18 val.
Kur? Širvintų rajono Bartkuškio mokyklos sporto salėje (Aušros g. 25).

Gyventojai savo klausimus minėta tema iki susitikimo gali siųsti el. paštu **info@iae.lt.**
Kviečiame aktyviai dalyvauti!

Main Takeaways

- RW amounts due to remained logs are known with a relatively high accuracy
- A number of iterative safety assessments and necessary evaluations were acomplished to come to immediate dismantling strategy
- Do not underestimate your own capabilities only – outside expertise and experiences are of great importance. However, please be demanding and critical during the development of documents, because later discrepancies (if any) will cost you time and money

Main Takeaways

- Be open, proactive and communicative with the stakeholders -> this will clearly help to cope with challenges due to their first-of-a-kind in a timely manner
- Although good planning is a half part of success, due to the legacy aspect, add space for unexpected contingencies

Then

Then (before decommissioning)

Now

In the Near Future