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Costing and Funding Mechanism for RW&SF Management and Disposal in Slovenia

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Slovene Nuclear Program

Small nuclear program

½ NPP, 727 MW_e – electric power; 5 to 6 TWh/y
operated by NEK, owned by Slovenia (GEN) and
Croatia (HEP)

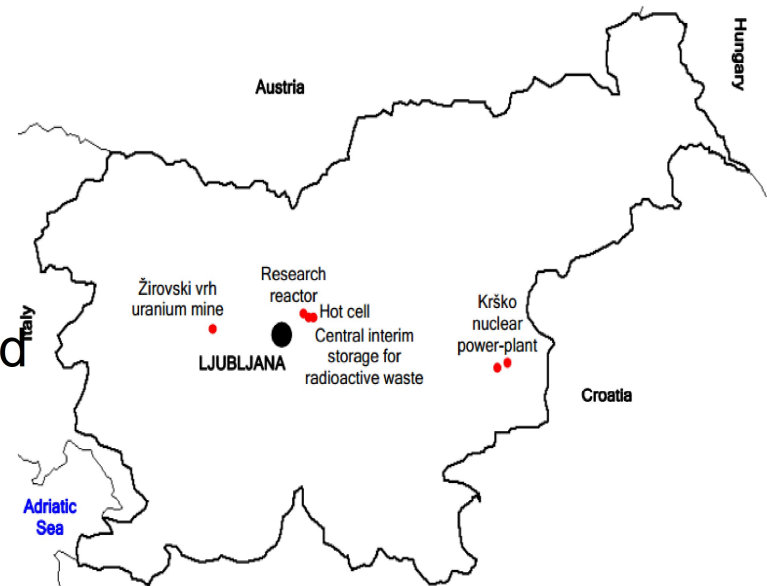
1 research reactor; 250 kW_{th}
operated by JSI, owned by RS

1 closed, remediated uranium mine (operation
period 1984 - 1990)

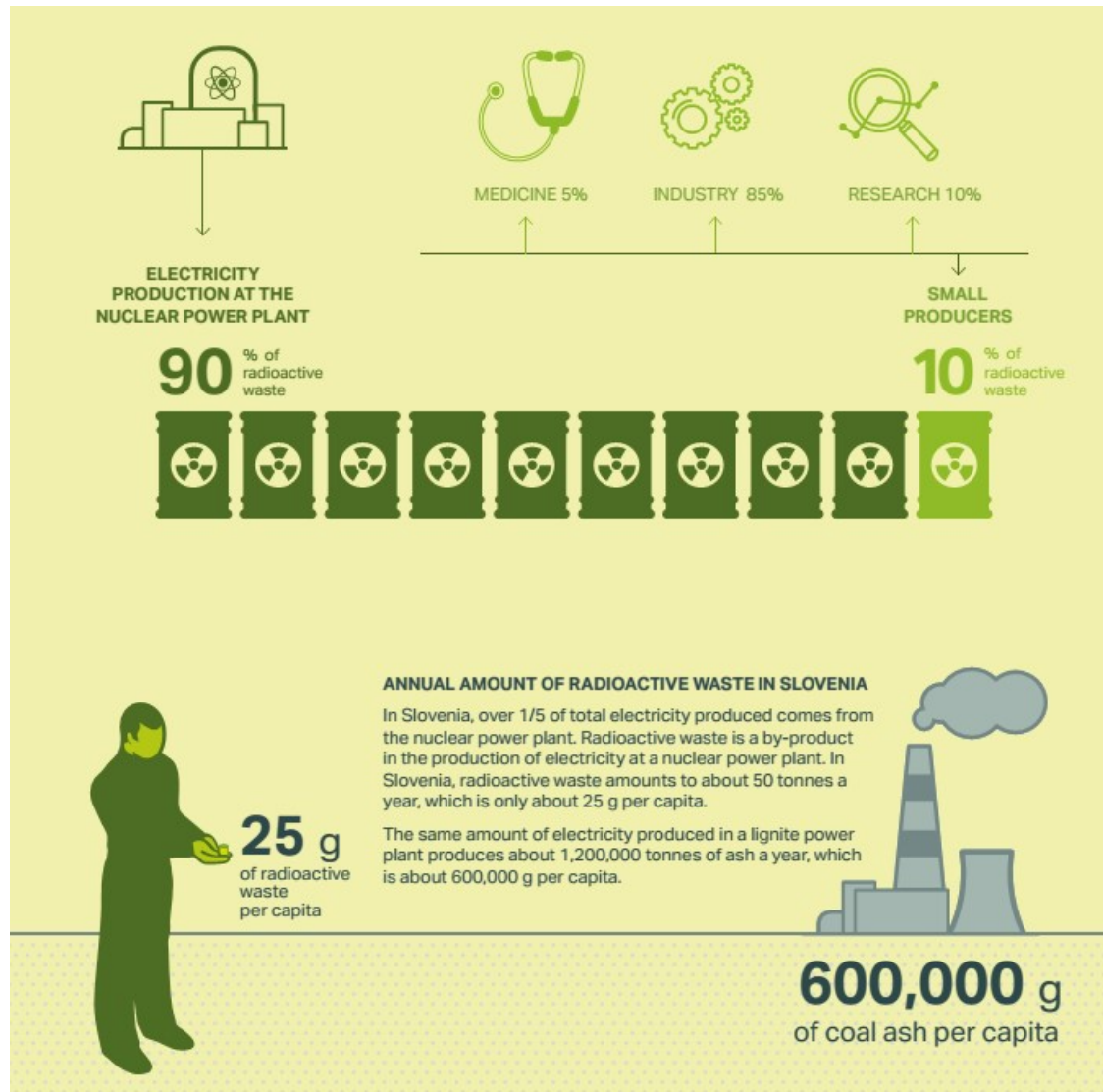
2 disposal sites operated by ARAO and RŽV,
owned by RS

1 central interim storage facility for institutional
waste operated by ARAO, owned by RS

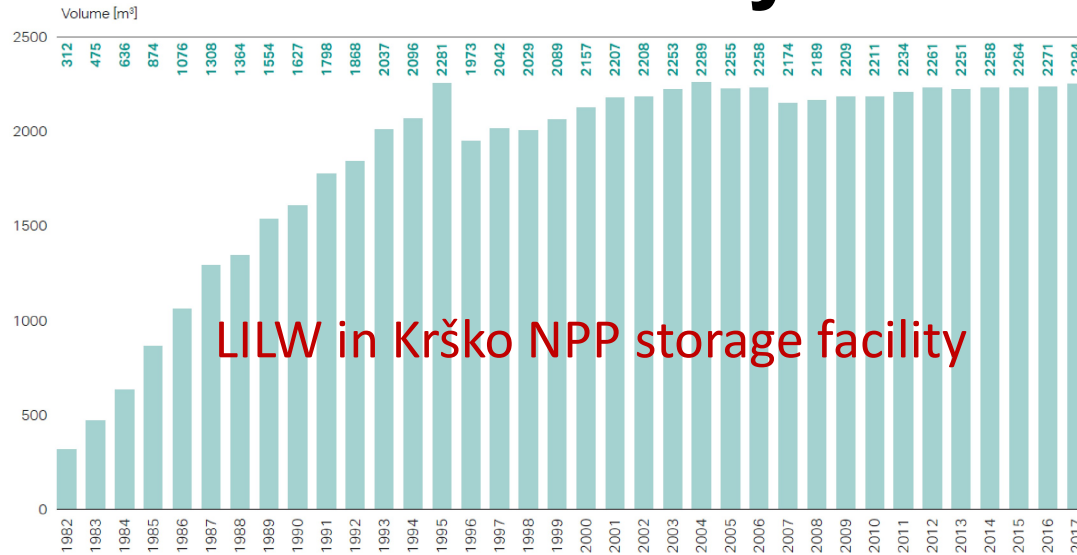
1 approved site for LILW repository (2009-)
preparation of the documentation needed for
construction permit approval



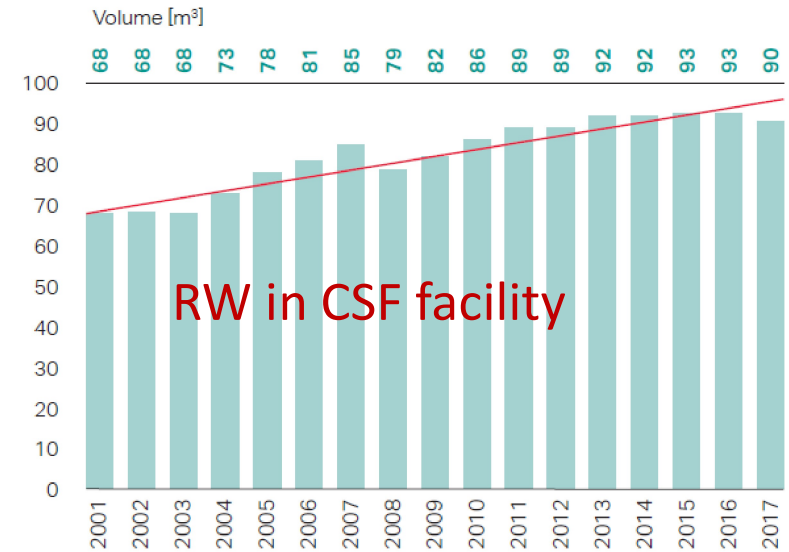
Where does radioactive waste come from?



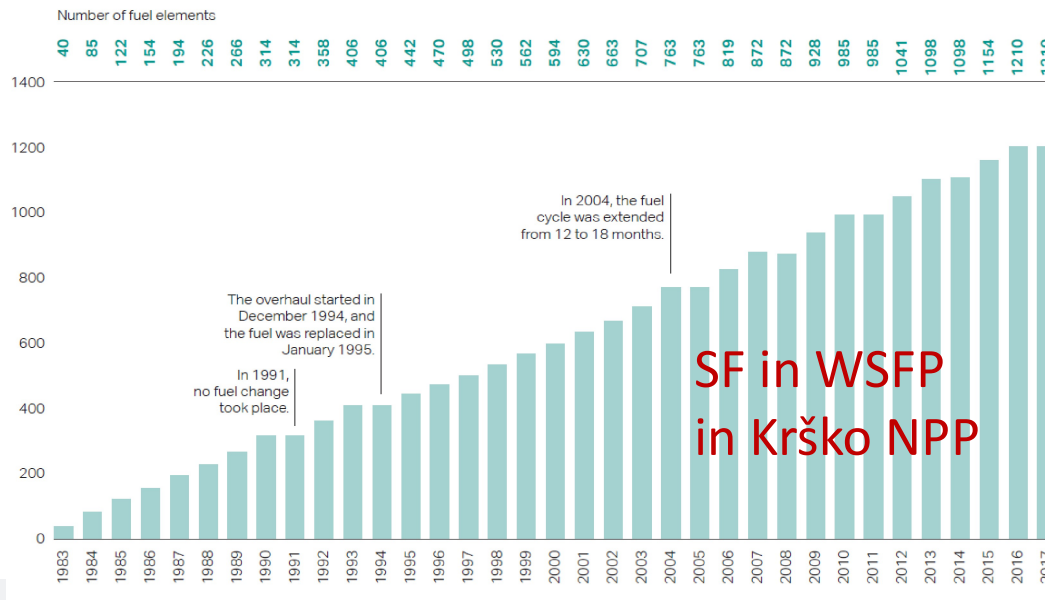
RW&SF Inventory in Slovenia



LILW in Krško NPP storage facility



RW in CSF facility



SF in WSFP
in Krško NPP

Valid legal framework

- Ionising Radiation Protection and Nuclear Safety Act from 2002 harmonized with EU legislations (amended in 2003, 2004, 2011, 2015 and 2017)
- RESOLUTION On the National Programme for Radioactive Waste and Spent Nuclear Fuel Management for the 2016–2025 Period (ReNPRRO16–25)
- The Act Regulating the Fund for Financing the Decommissioning of the Krško Nuclear Power Plant and the Disposal of Radioactive Waste from the Krško NPP (the Decommissioning Fund Act)
- Agreement between the Government of the Republic of Slovenia and the Government of the Republic of Croatia on the Regulation of the Status and Other Legal Relations Regarding the Investment, Exploitation and Decommissioning of the Krško NPP
- Radioactive waste and spent fuel management activities are funded with due regard to the “polluter pays principle”.

Sources of RW&SF Management in Slovenia

- The activities related to radioactive waste and spent fuel management in Slovenia are financed from three main resources:
 1. the funds provided by the Slovenian owner of the 50% share in the NPP Krško, GEN energija, d.o.o., that is on the basis of the Decommissioning Fund Act obliged to pay into the Slovenian fund a contribution in the amount of 0.30 euro cents for each kWh of electricity produced at NPP Krško for GEN energija.
 2. payments from institutional waste generators that are public service users in accordance with the Tariff of Radioactive Waste Management Services; and
 3. funds from the state budget.

Fund for Financing the Decommissioning of the Krško NPP and the Disposal of RW from the Krško NPP - investment and financing framework

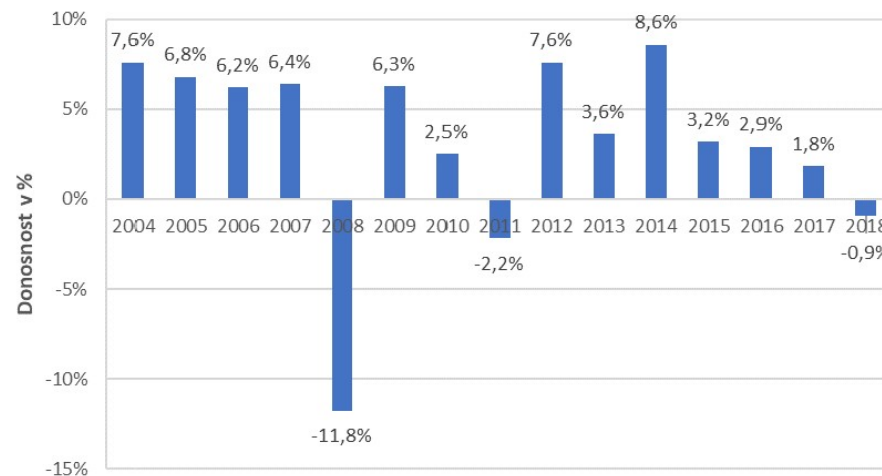
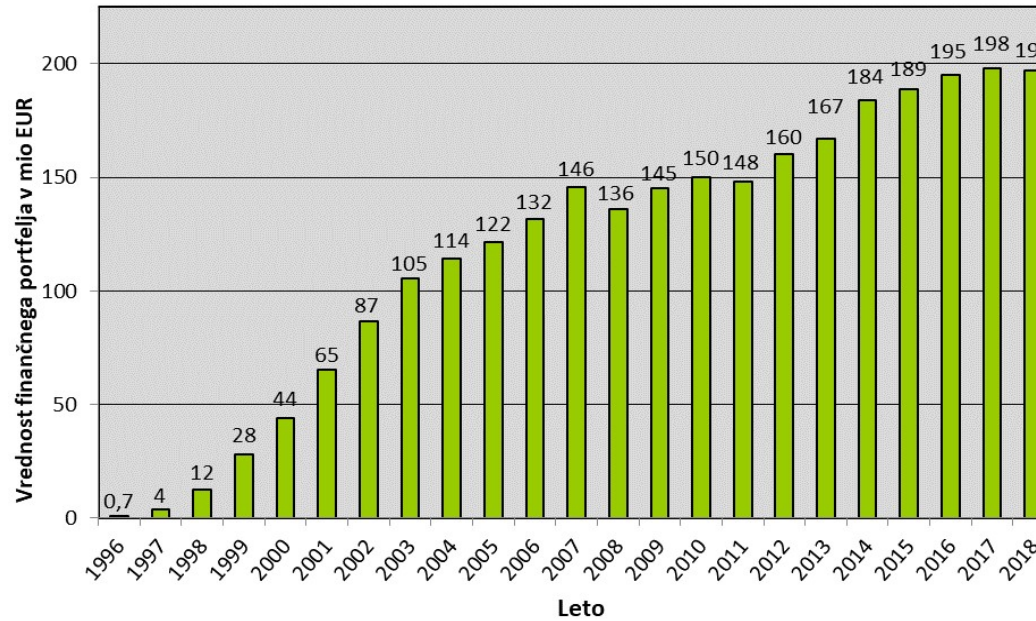
- Established in December in 1994 to raise financial resources for developing an effective and sustainable solution to the decommissioning of the NPP and for the final disposal of its radioactive waste and spent nuclear fuel
- The Fund’s primary investment objectives are to maintain the value of its assets and generate return on its assets.
- The Fund is responsible for raising funds for the decommissioning of the Krško NPP as well as safe storage (after NPP end of operation) and final disposal of SF and RW
- The financial assets will be collected during the lifetime of the Krško NPP
- The amount that has to be paid into the Fund is defined on the basis of calculations presented in the Decommissioning Program and Program of Radioactive Waste and Spent Fuel Management (2004), which takes into account the planned date of NPP closure, the duration of repository operation, and the post-closure period **and determined by law in Slovenia**
- The current contribution to the Slovenian fund for financing one half of the decommissioning and spent fuel and radioactive waste disposal is 0.30 Euro cents per kWh of the Slovenian share of energy produced by the Krško NPP.

- Under preparation of Decommissioning and Disposal Program rev.3 new values and annuities will be selected and implemented

Fund for Financing the Decommissioning and the Disposal of RW - investment and financing framework cont.

- The Fund’s primary investment objectives are to maintain the value of its assets and generate return on its assets.
- The assets from the fund can be used solely for:
 - financing the preparation and execution of projects of safe and final disposal of SF and RW from the Krško NPP
 - financing the preparation and execution of the project for safe decommissioning of the Krško NPP
 - payment of compensation to local authorities for restricted land use for the repository for SF and RW from the Krško NPP until its closure in

Value of the Fund’s financial portfolio in 2018



Funds collected with payments from institutional waste generators

- Implementation of the “polluter pays principle”
- There is no special fund for managing institutional radioactive waste in Slovenia
- The management of institutional radioactive waste in Slovenia is funded from the state budget and the fee paid by the users of the mandatory service of general economic interest, e.g. waste generators when they transfer the waste to the ARAO, which is to perform the service of general economic interest

- The fee paid by the users of the mandatory service of general economic interest in

Financial resources

- Krško NPP: two owners are jointly to ensure funds for the decommissioning and final disposal – Two separate Slovenian and Croatian funds for the decommissioning of the Krško NPP and RW&SF disposal
- Triga Mark II Research Reactor: state budget
- Central Storage Facility: fee paid by the waste generators + state budget
- Žirovski vrh Uranium Mine: state budget

LILW repository investment costs, scenario comparison

Investment costs in 000 EUR, constant prices, 2013	BASIC SCENARIO		EXTENDED SCENARIO		Comparison ESC/BSC
1. Acquisition of the location	8.367	5,3%	8.452	4,7%	1,0%
2. Cooperation with the local communities and communication activities	6.957	4,4%	7.089	3,9%	1,9%
3. Documentation, engineering, operation procedures, analysis	21.780	13,8%	24.328	13,7%	11,7%
4. Construction and equipment	31.488	20,0%	43.250	24,3%	37,4%
5. Compensations for the local communities	64.899	41,2%	64.899	36,4%	0%
6. Contingencies	7.506	4,8%	9.747	5,5%	29,9%
TOTAL Investment	140.997	89,5%	157.548	89,5%	11,7%
VAT	16.519	10,5%	20.611	11,6%	24,8%
TOTAL with VAT	157.515	100,0%	178.151	100,0%	13,1%

Investment costs, scenario comparison with funding sources

- In the case of EXTENDED SCENARIO the costs are proposed to be divided among Slovenia and Croatia for the RW originating from Krško NPP.

Investment costs in 000 EUR, constant prices, 2013		BSC		ESC	
Slovenia	1. Financing from Fund for Decommissioning and Disposal	127.147	80,72%	79.574	44,67%
	2. Financing from national budget	30.368	19,28%	19.003	10,67%
Croatia	3. Financing from Fund for Decommissioning and Disposal	0	0	79.574	44,67%
TOTAL		157.515	100%	178.151	100%

Total LILW repository costs

Costs in 000 EUR, nominal costs 2013	Basic scenario	Extended scenario
Investment with VAT	157.515	178.158
Operation with VAT	327.036	344.087
Long-term control and maintenance	10.000	10.000
Total	494.551	532.245
Disposal ¹ costs in 000 EUR per m ³	33,73	20,45
Disposal ² costs in € per MWh (nominal)	3,58	1,93

[1] Disposal volume (containers gross volume) of LILW for BS is 14.662 m³ and ES scenario 26.028 m³

[2] 138 TWh estimate was used for Slovenian share of electricity production until 2043

Estimated costs od SF&HLW storage and disposal (RS+RC)

Activity, nominal costs 2010	Variant 1: 40- years of NPP operation) nominal (in mio €)	Variant 2: 60- years of NPP operation nominal (in mio €)
SF storage	320	418
SF disposal	1136 (10 years, 2068-2077)	1330 (15 years, 2088-2102)
tons HM	620	912
€/kg HM storage	516	458
€/kg HM disposal	1832	1458

Assessment of the costs of implementing the national programme for RW and SF based on ReNPRRO16-25

	2016		2017		2018		2019		2020		2021		2022		2023		2024		2025	
	Fund	Budget	Fund	Budget	Fund	Budget	Fund	Budget	Fund	Budget	Fund	Budget	Fund	Budget	Fund	Budget	Fund	Budget	Fund	Budget
CSF operation and public service provision of small producers		700		700		700		700		700		700		700		700		700		700
Closure of the disposal sites of mining and hydrometallurgical tailings at the Žirovski Vrh Mine and long-term monitoring and maintenance of the disposal sites		1,500		2,500		150		150		150		150		150		150		150		150
Cost of the construction and operation of the LILW repository	2,099	501	7,103	1,797	8,879	2,121	21,068	5,032	7,911	1,889	8,233	1,967	8,233	1,967	8,233	1,967	8,233	1,967	8,153	1,947
Costs of monitoring activities in the field of HLW and SF		50		50		50		50		50		50		50		50		50		50
Costs of drawing up the Programme for Decommissioning the TRIGA MARK II Research Reactor		30		30		30		30												
Costs of preparing the revision of the Krško NPP Decommissioning Programme and Disposal Programme for RW and SF from Krško NPP	75										150									
Compensation provided to local communities for the LILW repository	5,700		5,700		5,700		5,700		5,700		5,700		5,700		5,700		5,700		5,700	
Compensations provided to local communities for the CSF		210		210		210		210		210		210		210		210		210		210
Compensations provided to local communities for the disposal sites of mine and hydrometallurgical tailings		350		350																
Implementation of the programme for systematic screening of the working and living environment and raising awareness of measures to reduce exposure due to the presence of natural radiation sources at work which relate to the identification of materials / activities that can generate waste containing natural radionuclides		10		10		10		10		10		10		10		10		10		10
Total:	7,874	3,321	12,803	5,297	14,579	3,241	26,768	6,182	13,611	3,009	14,083	3,087	13,933	3,087	13,933	3,087	13,933	3,087	13,853	3,067
R&D in the field of RW and SF management ^a		400		400		400		400		400		400		400		400		400		400
Total – Fund (2016–2025)	145,370																			
Total – Budget (2016–2025)	36,465																			
Total – R&D (2016–2025)	4,000																			
Total – ReNPRRO16–25	185,835																			

Thank you for your attention!