EEAE ΕΛΛΗΝΙΚΗ ΕΠΙΤΡΟΠΗ ΑΤΟΜΙΚΗΣ ΕΝΕΡΓΕΙΑΣ
GREEK ATOMIC ENERGY COMMISSION

7th Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

27 June – 8 July 2022

Greece
Country Group 1

www.eeae.gr

Presentation outline

- Summary of basic information on the national programme, including the matrix
- Changes in the national program since the 6th RM
- Actions on suggestions and challenges from the 6th RM
- Current challenges
- Significant events since the 6th RM
- Updates since the submission of National Report
- The impact of the SARS-CoV-2 pandemic

Summary of basic information

- ✓ Greece has no NPPs
- ✓ One research reactor (GRR-1) in extended shutdown. All used LEU elements have been repatriated to the USA since February 2019. The remaining fresh LEU fuel elements are envisaged to be exported to Canada
- ✓ Radioactive waste originates from:
  - non nuclear applications: medical, research, industrial, consumer products
  - past operation of the reactor
- ✓ One facility for storage of RW (NRWIS)

Summary of basic information – list of RW and RM

RW in Greece are VLLW or LLW small amount of waste that may be classified as ILW, mainly some parts from the dismantled core of the reactor. The inventory includes:

- ✓ Solid and liquid RW (regeneration bed resins, activated and contaminated objects, etc.),
- ✓ Orphan RS and RM from scrap metal, illicit trafficking and actions, bankrupt companies (mostly transferred to the NRWIS)
- ✓ Disused RS and RM from activities of industrial, medical, research or other facilities, which cannot be repatriated or exported to a recycling facility abroad (temporary stored till final management, under regulatory control)

Summary of basic information – list of RW and RM

RW in Greece are VLLW or LLW small amount of waste that may be classified as ILW, mainly some parts from the dismantled core of the reactor. The inventory includes:

- ✓ Equipment and consumer products containing RM, mainly smoke detectors and lightning rods (temporary stored till final management)
- ✓ Radioactive contaminated objects containing NORM
- ✓ Liquid and solid RW from the operation of medical and research laboratories, which are managed by decay and clearance

Summary of basic information – inventory (a)

NCSR Demokritos

	NRWIS		GRR1		Decommissioning GRR1		Total NCSR	
	m^3	MBq	m^3	MBq	m^3	MBq	m^3	MBq
VLLW	12,8	26			14,44	*	27,24	26
LLW	8	245	0,02	0,3	0,46	*	8,48	245,3[b]
ILW	0,01	100000[c]			0,92	700000[b]	0,93	
Legacy (objects in 100 drums)	20	1000[C]					20	1000
Legacy (objects in 50 drums)			10	1000			10	1000
VLLW (cemented sludge in 5 drums)	1	60					1	60
VLLW (Liquid- Sludge)			26	570	0,6	*	26,6	570
Graphite- Waste					5,6	*	5,6	*
Contaminated Soil Pu	0,3	*					0,3	*
Contaminated plates Pu			0,01	*			0,01	*
Contaminated objects (maintenance, house-keeping)			1	50			1	50
Consumer Products (lightning rods)	0,4	8000[d]					0,4	8000
Consumer Products (smoke detectors)	0,2	405[d]					0,2	405
Consumer Products (Lamps, depU blocks)	0,5	500[d]					0,5	500
TOTAL NCSR	43,21	10236	37,03	1620,3	22,02		102,26	11856,3

* to be defined

[b] coarse estimate of significant uncertainty - decommissiong plan under development

[c] based on external dose surveys - characterization pending

[d] assuming typical item activities - registration in progress

ILW activity estimation is not included in the TOTAL NCSR activity - MBq

Summary of basic information – inventory (b)

On site storage at facilities

	m^3	MBq
Contaminated Ash	75	10000
Objects contaminated with NORM	100	2500
Consumer Products (lightning rods)	1,9	28300
Consumer Products (Vehicle Instr., Lamps)	1	500

Disused sources (DSRS)

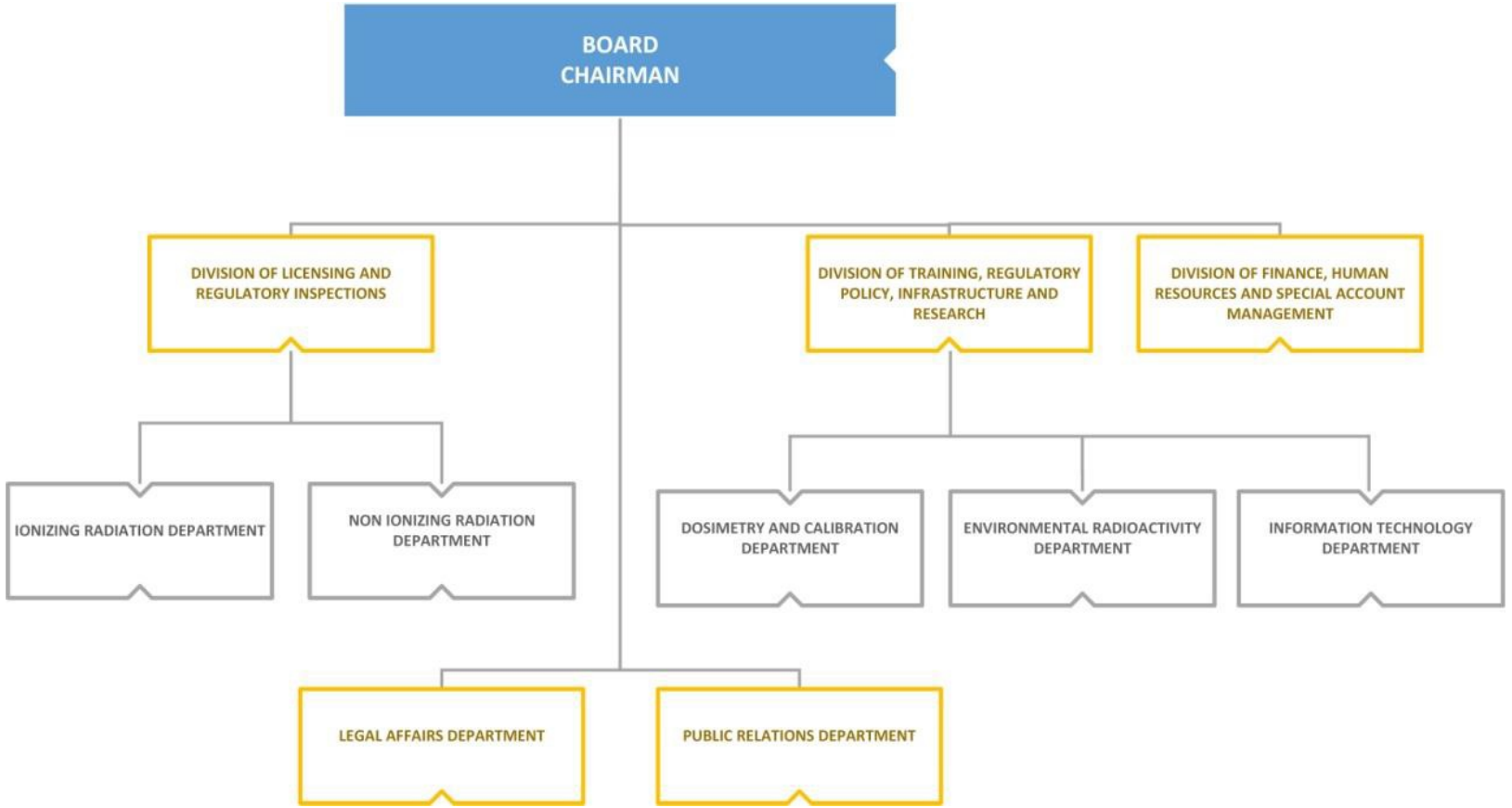
	NRWIS	Facilities
	Number of DSRS	
Category 1		1
Category 2	1	5
Category 3	53	4
Category 4	15	57
Category 5	312	210

Summary of basic information – competent authority

Greek Atomic Energy Commission-**EEAE**

the competent regulatory authority for the control, regulation and supervision in the fields of nuclear energy, nuclear technology, radiological and nuclear safety and radiation protection.

EEAE is operating as a public entity and enjoying full administrative and financial independence in relation to its duties. It is supervised by the Alternate Minister of Development and Investments (the Minister).



National Committee for Radioactive Waste Management, **EEDRA** is a 9-member collegiate body with advisory and supportive role towards the Minister on the implementation of the practical aspects of the national policy and national framework and on the coordination of the bodies involved in RW management

www.eeae.gr

Summary of basic information

Spent fuel management policy

- SF shall be returned to a supplier or producer country.
- Agreement for fuel return shall be in place prior to any import of nuclear fuel.

Spent fuel management practices

- The HEU of the GRR-1 was returned to the USA in 2005.
- The LEU has been repatriated to the USA in 2019, under an agreement with the US DoE.
- There is no spent or irradiated fuel today. The remaining fresh fuel is subject to EURATOM and IAEA safeguard inspections. It is envisaged to be exported to Canada (McMaster University research reactor).

Summary of basic information

RW management policy

- RW produced in Greece shall be either cleared according to the clearance levels or disposed in the national territory, unless an agreement is in place for export.
- Until the establishment of a national disposal facility, waste shall be stored safely under regulatory control.
- Regarding sealed radioactive sources, formal acceptance of the importer shall be in place, prior to the import of a sealed source, to return the source back to the manufacturer after the end or its utilization period.

RW management practices

- Short lived waste: storage until decay and clearance.
- RW that cannot be cleared: Storage in producers' authorized storage areas or in NRWIS.
- Disused sealed sources: return to the supplier or exported for recycling as much as possible.
- Orphan sources are temporarily stored mostly in NRWIS.
- EEAE keeps a national inventory for the sources and RW in the country.

Summary of basic information - matrix

Type of Liability	Long term management policy	Funding of Liabilities	Current practice/ Facilities	Planned facilities
Spent Fuel	N/A	N/A	N/A	N/A
Nuclear Fuel Cycle Waste	N/A	N/A	N/A	N/A
Non-power waste	On site storage, decay and release for short live waste. Longer lived waste are stored until final management solution.	Licensee, Government	On site storage, decay and release for short lived waste. Longer lived waste are stored until final management solution	RW Interim Storage and Management Facility Options for disposal facility selected, sitting is being investigated
Decommissioning Liabilities	Decommissioning waste stream included in the national program waste streams.	Licensee, Government	Decommissioning plan is required in the national regulatory framework	No plans have been submitted yet
Disused Sealed Sources	Return to the manufacturer. Recycling.	Licensee, Government	Return to the manufacturer. Stored under regulatory control. Orphan sources are stored mostly in NRWIS	RW Interim Storage and Management Facility Options for disposal facility selected, sitting is being investigated
Mining & Milling waste	N/A	N/A	N/A	N/A

Summary of basic information

NRWIS: Licensed activities

- Storage of RW and disused sources
- Low activity sources (e.g. lightning rods) dismantling
- Characterization of RW
- Re-packaging of RW from past operation of reactor (e.g. resins)
- Clearance

Changes since the 6th Review Meeting

- The national **Radiation Protection Regulations** have been completely renewed (1 PD, 3 MD, EEAE Decisions and Guidance documents).
- The national legislative framework for the **Nuclear Safety** has been completed.
- The **second version of the National Program** for the management of spent fuel and radioactive waste has entered into force with specific milestones and clear timeframes.
- A **detailed assessment of potential emergency exposure situations** and associated protection strategies has been completed (based on GSR part 7).
- An **ARTEMIS mission** has been invited in order to obtain an independent expert opinion and advice on SF&RW management, decommissioning and remediation (the mission is scheduled for 2023).

Actions on suggestions and challenges from the 6th Review Meeting

2nd National Program for period 2020-2023

The second version of the National Program has entered into force. It includes:

- **Specific Milestones and Timeframes regarding**
  - (i) Recycling of sealed radioactive sources (RS) and radioactive material (RM); and
  - (ii) Operation of the national facility for the interim storage and management of RW
- **Updated Inventory and Classification of Radioactive Waste**

Actions on suggestions and challenges from the 6th Review Meeting

2nd National Program for period 2020-2023

The second version of the National Program has entered into force. It includes:

- **Technical solutions for the disposal facility**:
  a near surface disposal facility with engineered barriers (vault) (and possibly a borehole, if necessary). The suitability of the site of the existing interim storage facility of the NCSR Demokritos to accommodate a RW disposal facility is investigated. If this solution is not found suitable, the siting of the disposal facility in a new site will be investigated.
- **Measures for the post-closure of the disposal facility**:
  a specific action addresses plans and measures for post-closure period of the disposal facility, including environmental impact study, safety case, environmental monitoring.

Actions on suggestions and challenges from the 6th Review Meeting

2nd National Program for period 2020-2023

The second version of the National Program has entered into force. It includes:

- **Estimation of Costs**, such as
  - ✓ Export of nuclear material ~ 400,000 Euros
  - ✓ Operating costs of NRWIS facility ~ 100,000 Euros per year
  - ✓ Possible expansion of the NRWIS facility to a disposal facility ~ 1,000,000 Euros or
  - ✓ Establishment of a disposal facility in a new site 2,000,000 Euros

Actions on suggestions and challenges from the 6th Review Meeting

2nd National Program for period 2020-2023

The second version of the National Program has entered into force. It includes:

- **Financial arrangements and sources**
  - ✓ An independent deposit fund of 1 million Euros in EEAE Special Account for Research Grants (ELKE)
  - ✓ Contributions by the state budget: the state budget of 2019 covered the financing of the repatriation to the USA of the irradiated nuclear fuel of the GRR-1 research reactor
  - ✓ The government included in the project of the Recovery and Resilience Facility (RRF) the funding of an investment of 3.65 million Euros for the export of DSRS and the characterization of historical waste of NCSR Demokritos

Significant events since the 6th RM

The second version of the National Program which has entered into force and concerns the period 2020-2023.

The actions of the National Program are grouped in the following two specific objectives:

- ✓ **Objective A**: Recycling of sealed radioactive sources (RS) and radioactive material (RM) with 8 specific actions.

- ✓ **Objective B**: Operation of the NRWIS interim storage facility and a future RW disposal facility with 5 specific actions.

Significant events since the 6th RM

#Milestone	Action	Timeframe	Action status as in July 2022
A1	Informing the RS owners about the recycling procedures of the disused RS they posses	12/2020	Completed
A2	Drafting a protocol for the withdrawal of disused RS and other radioactive materials aiming their export for recycling in authorized recycling and management facilities	6/2021	EEAE has informed the RS owners and waits the delivery of their action plans and schedules.
A3	Removal of 40% of the Category 1 and 2 disused RS	6/2022	Completed
A4	Removal of Category 1 and 2 disused RS	6/2023	In progress
A5	Removal of Category 3 disused RS	12/2023	In progress
A6	Investigation to find a solution for the export of category 4 and 5 disused RS	12/2023	In progress
A7	Export of the remaining quantity of fresh (non-irradiated) nuclear fuel of NCSR "Demokritos"	6/2021	Export to Canada is envisaged. Initial schedule delayed.
A8	Investigation to find a solution for the repatriation of the natural uranium elements (fresh) of the dismantled NTUA sub-critical research assembly.	6/2022	In progress

Significant events since the 6th RM

#Milestone	Action	Timeframe	Action status as in July 2022
B1	Memorandum of Understanding (MoU) between EEAE and NCSRD	12/2020	Completed
B2	Overview of national legislation on the environmental permitting system and site of a radioactive waste disposal facility	6/2021	In progress
B3	Specialization of the regulatory framework for the licensing of RW management and disposal facilities including the period after the closure of the disposal facility	3/2022	In progress. The first draft has been already prepared.
B4	Decision on the expansion of the operation of the NCSRD RW and RM interim storage facility to a RW disposal facility	6/2023	In progress. The conduction of a feasibility study and a preliminary environmental impact study has been assigned by EEDRA and the EEAE Board to a group of experts of the NTUA.
B5	Finalization of data analysis related to (any) disposal facility: Environmental assessment strategy; Environmental impact study; Safety analysis report; Precise financing plan; Facility control and monitoring of environmental radioactivity for the post-closure period	12/2023	Not started, yet.

Updates since the submission of National Report

- Submission of the proposal for financing the characterization of the historical waste and the export of DSRS (included in the plans of the Recovery and Resilience Facility -RRF)
- Update of the inventory to include most recent data on historical waste and waste from the decommissioning of the research reactor
- Actions have started for the export of the remaining nuclear material (from NCSR Demokritos and NTUA)
- Improvement of the safety of the existing storage facility incl. IMS and physical protection. The license has been renewed.

The impact of the SARS-CoV-2 pandemic

- The authorization process was not affected
- The inspection process had to be modified and conducted either remotely or with limited presence of inspectors and personnel from the licensee.
- The communication with the licensee was performed mainly remotely using every possible way. EEAE tried to strengthen the communication activities with the authorized parties
- The pandemic raised questions of trust between public and competent authorities. It provided opportunities to gain trust in some specific cases. The disruption in the airlines affected the project of the transport of the non-irradiated, fresh nuclear fuel to Canada.

Questions and comments received

Topics identified in questions and comments:

Article	C/Qs	Important Topics (number of questions)
General	1	LLW management
Article 9	1	Interim storage capacity
Article 12	1	Duration of operation license and periodic safety review
Article 13	1	Public participation
Article 15	1	Final disposal implementation
Article 16	1	Decommissioning strategy for research reactor
Article 19	1	RW release and clearance
Article 23	1	Quality management
Article 24	1	Radiation protection authorization
Article 27	5	Inspections on transport Implementation of international regulation RW transboundary movements (2)
Article 28	1	Collection of consumer goods
Article 29	1	Decommissioning plan
Article 32	6	RW transboundary movements ILW management National program for SF&RW Extended shutdown duration and decommissioning of GRR-1 (2) RW classification
Total	22	

(From Coordinator‘s report)

Questions and comments received

Status of Greece answers to questions: all questions answered

Name of CPs	Country Group	Number of Cs/Qs	Number of Qs answered
Switzerland	1	7	7
USA	1	1	1
Russian Federation	5	2	2
France	2	6	6
Germany	7	4	4
Slovenia	3	1	1
Iceland	1	1	1

(From Coordinator‘s report)

Conclusions

- The legislative framework has been significantly reinforced.
- The Second National Program has entered into force.
- Decision making whether the construction of a disposal facility should be considered at a new site or be based on the extension of the existing storage facility. In either case engineered near surface disposal shall be used (and maybe borehole for some waste of very small volume from the research reactor decommissioning).
- Challenges: *to make a success story of the RRF program, to make the maximum use of the ARTEMIS mission recommendations.*

Thank you!

facebook.com/eeaegr

twitter.com/eeaegr

Instagram/eeaegr

www.eeae.gr