



RADIOACTIVE WASTE IN A SIMS COUNTRY - PORTUGAL

I.PAIVA, IST-ID

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Acknowledgments

- Radiation Protection and Safety Laboratory (LPSR/IST)
- Waste Management Operator - A. Baptista
- Environmental Protection Agency (APA), Regulator - P. Do Rosário, M. Malta, J. Martins

REPORTS:

- National Report to the Joint Convention, Eighth Review Meeting of the Contracting Parties. Fifth National Report by Portugal, August 2024
- Presentation to the Regional Workshop Regional Workshop on Waste Acceptance Criteria Development and Use. National presentation - PT, Vienna, 2022
- Conclusions from IAEA TC Expert Mission on Options for Management of NORM Residues, Lisbon, July 2022
- Report from IRRS Mission, Lisbon, Feb 2022
- Report from ARTEMIS Mission, Lisbon, May 2023
- Next IAEA Mission: To provide guidance on the preparation of a preliminary decommissioning plan for the storage facility PRR, Lisbon, Oct 2025



Surface area: 92 212 km²
(Source: Eurostat 2021)

Population: 10.3 million (Source:
Eurostat 2019)

Around 10.000 authorized
facilities that use radiation
sources

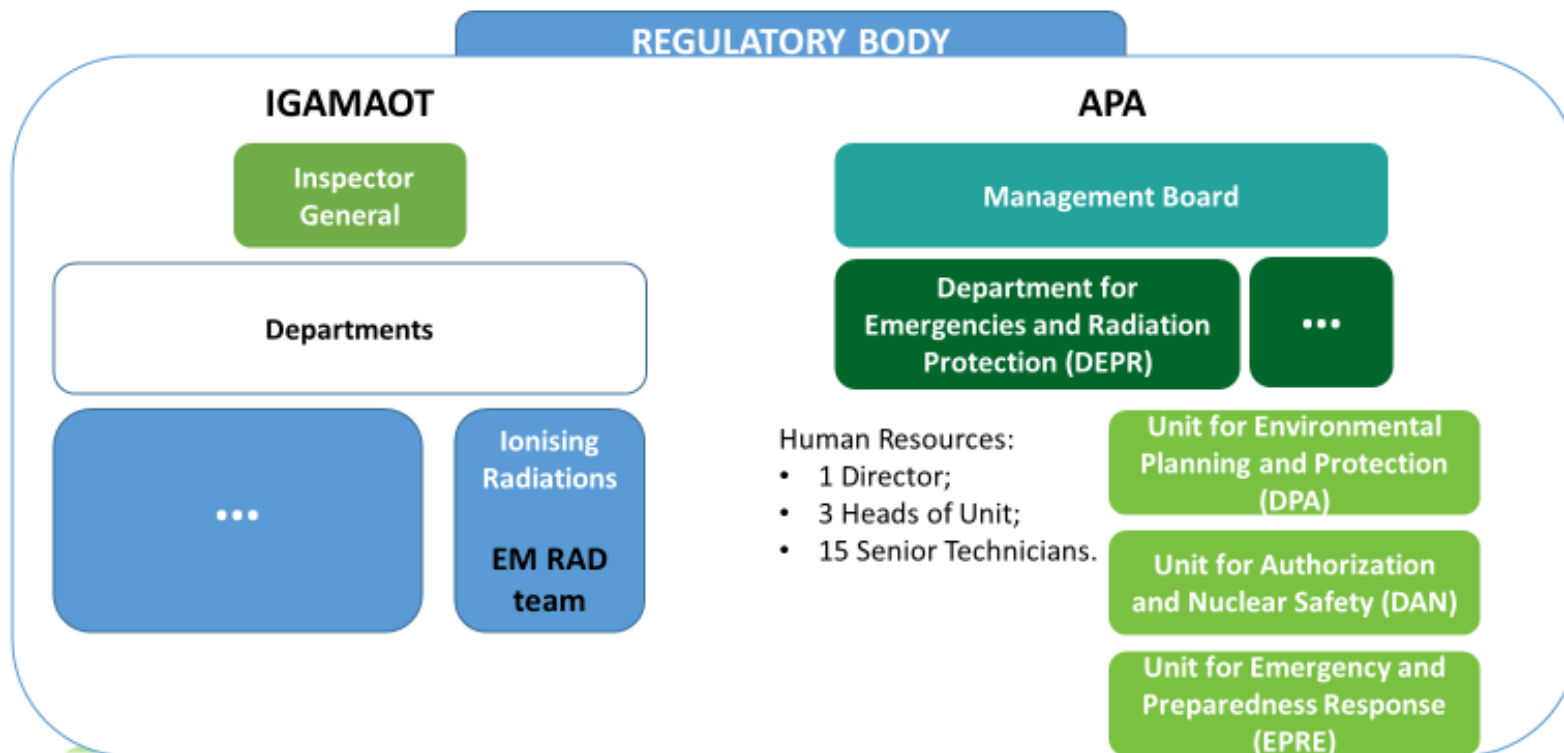
There is 1 Research Reactor
(currently in transition to
decommissioning)

There are no NPPs or SF in
Portugal



Regulatory Organization

Regulatory Body in Portugal



WASTE CLASSIFICATION

Radioactive waste produced in Portugal results mainly from industrial, medical and research activities and are classified as VLLW, LLW and ILW.

1st PNGCIRR - National Programme for the Management of Spent Fuel and Radioactive Waste (PNGCIRR for 2015-2019), published in the official journal in September 2017

2nd PNGCIRR published in December 2022

| Classification | Very Short Lived $T_{1/2} < 100$ d | Short Lived $T_{1/2} < 31$ y | Long Lived $T_{1/2} > 31$ y |
|----------------|---------------------------------------|---|-----------------------------------|
| VLLW | Decay at the producers | Decay at interim storage facility, with possible future clearance | |
| LLW | Clearance | Decay at interim storage facility, with possible future clearance | Decay at interim storage facility |
| ILW | | Decay at interim storage facility | |
| HLW | NA | NA | NA |

RW IN PORTUGAL

- Past uranium (U) and radium (Ra) mining and milling;
- Contaminated scrap metal;
- Smoke detectors and lightning rods;
- Depleted uranium (DU) (under safeguards inventory);
- DSRS;
- More recently, large amounts of NORM have been identified as requiring management.

| | Current or planned waste form | Main radionuclides involved |
|------|--|---|
| VLLW | NA | NA |
| LLW | Solid, liquid (drums for solids; plastic containers for liquids) | ^3H , ^{14}C (mainly medical and R&D waste) |
| | NORM | Scrap metal |
| ILW | Solid, cemented | ^{137}Cs , ^{60}Co , ^{241}Am :Be, ^{226}Ra , ^{252}Cf (mainly DSRS, lightning rods) |
| HLW | NA | NA |
| SF | There is no SF in Portugal. The Portuguese Research Reactor (RPI) was a 1 MW pool-type Research Reactor, operating since the 1960s. The RPI was shutdown in 2016 and the SF shipped to the USA in 2019. | |

LIABILITIES MATRIX

| Type of Liability | Long-term Management Policy | Funding Liabilities | Current practices/Facilities | Planned Facilities |
|--------------------------|--|---|--|--------------------------|
| Spent Fuel | All past spent fuel has been returned to the USA. There is no spent fuel presently stored in Portugal or intended activities | State funds None None | State funds None None | State funds None None |
| Nuclear Fuel Cycle Waste | There are no fuel cycle activities in Portugal | Not applicable | None None | None None |
| Application Waste | Management at PRR, operated by IST | State funds and fees collected from waste producers | On-site temporary storage Waste sorting and conditioning Waste minimization policy under the National Programme | None |
| Decommissioning | Under discussion | State funds | Under discussion | Under discussion |
| Disused Sealed Sources | Return to supplier as disused source If not possible, classification as radioactive waste, followed by management at PRR facility | State funds and fees collected from waste producers | Return to supplier as disused source If not possible, classification as radioactive waste, followed by management | None |

CHALLENGING RW

- Characterization of legacy waste with clearance criteria /aims (in progress)
800 drums containing historic waste not identified or records (most from medical applications);
The methodology consists mainly on the assessment of the environmental dose equivalent rates at contact and at 1 m distance, activity concentration measurements by gamma spectroscopy for gamma emitters and wipe tests analysis by liquid scintillation counting for alpha and beta emitters. Identified materials will be segregated and compressed aiming at volume reduction;
- Development of waste acceptance criteria (WAC)
The National Plan (PNGCIRR) does not consider a final destination facility, nor a WAC system yet.
The PRR receives the RW previously classified as such by APA.
- Research and development for disposal solutions ?
- Development of WAC for the future disposal facility ?
- A report about liquid waste in the PRR is undergoing.

Total capacity: 350 m³
Inventory at this point:
LLW: 272 m³
ILW: 16 m³
NORM: about to arrive more 70 m³



Courtesy: IST

- The PRR (technically an interim storage facility), was built in the 1961s, it is currently licensed by APA and it is operated by IST.
- Although there are established technical procedures, WAC has not being defined.
- The PRR has facing a lot of pressure regarding available storage capacity due to the large amount of uncharacterized legacy waste and NORM waste classified as radwaste.
- Operator reported the use of more than 90% of total storage capacity
- Characterization of the legacy waste started Jan 2025 – Many waste drums have been declassified by the Regulator APA.

The Radioactive Waste Facility (PRR) of the Engineering School of the University of Lisbon (IST), is located at the CTN, Loures Campus of this university



CTN aerial view, IST Courtesy.

PRR building plan, IST Courtesy.



E&T and R&D

- IST-ID was member of EURAD-1 (ROUTES) and it is member of EURAD-2 (ASTRA) and member of ENEN.
- A master course in radiation protection and safety, MPSR, is being carried out at the IST. The curricular unit Radioactive Waste is compulsory.
- IST-ID is attending many workshops and courses organized by the IAEA.
- A MSc. Thesis was finished in 2024 (Two- and Three-dimensional Models of Radionuclide Migration from a Near-surface Repository, Carvalhal, C.).
- IST-ID has been involved in EURATOM projects since FP4.
- Alternative long-term storage and disposal solutions have been studied under the framework of a R&D project (KADRWASTE) and a memorandum about specific siting for LILW, related to two locals in PT, was developed.
- Experimental work on Portuguese clays and radionuclides is being developed and the last paper has just been published: "Mineralogical and Geochemical Characterization of the Benavila (Portugal) Bentonites" Javier Garcia-Rivas et al, IST-ID/C2TN, Complutense University of Madrid and Salamanca University.



BENEFITS OF EURAD-1 / ROUTES

- Up-to-date knowledge on the topics addressed, access to a network of contacts
- Characterization of legacy waste with aim to prepare clearance processes
- Discussions on WAC development
- Awareness on other possible solutions, although not allowed at the moment e.g., incineration
- Other SIMS/LIMS examples on challenging RW and how they manage their issues (treatment, characterization technologies, others)
- Visits to other WMO Facilities.



WHAT ARE THE CHALLENGES WE FACE?

1. A National Policy for Management of Radioactive Waste is being developed, as recommended by a recent ARTEMIS Mission.
2. There is a need to revise the existing legal framework, to take into account:
 - i. the specificities of management of certain radwastes: NORM and organic and aqueous liquids containing ^3H and ^{14}C .
 - ii. establish future disposal options
 - iii. To ensure adequate funding provisions for long-term RW management
3. Completing the Characterization of legacy RW
4. Shortage of :
 - i. human resources with knowledge and dedicated to radwaste management activities



HOW CAN EURAD-2 HELP US?

- ASTRA and SUDOKU bringing experience from other SIMS can:
 - Identify best regulatory framework and implementation results in Countries with identical issues
 - Identify the organizations with larger experience that can provide assistance
 - Consider the possibility of using common facilities for RW disposal in neighboring Member States.
 - Help with the establishment of a long-term monitoring technical programme for legacy wastes including the technical options
 - Establishment of a safety and human health risk assessment programme
 - Lack of human resources cannot be easily solved.



HOW CAN EURAD-2 HELP US?

- Establish provisions for ensuring the further development of technical criteria for managing large amounts of NORM waste;
- Capacity building is still needed e.g. RW characterization. Main issues:
 - Improve radiological /chemical /physical characterization
 - Implementation of treatment options
 - Application of clearance levels (legacy waste, NORM, and others)
 - Establishment of WACs.
- Review current capacities for management of RW and establish arrangements to ensure that sufficient capacity is available and maintained for the future;



HOW CAN EURAD-2 HELP US?

- The mobility program can help to train people that can be future scientific resources (together with the IAEA technical courses specifically targeting professionals in the area).
- Webinars and lunch & learn seminars are great to target specific real situations that may impact some of the national issues. More lunch & learn seminars related to SIMS, are needed.
- To make available state-of-art science related to radwaste
- To implement and care of a web of connections that can be useful also for SIMS
- Important to increase the exchange of students between LIMS and SIMS.
- Learn from other MS's experience in the relationship with stakeholders and Civil society



HOW CAN EC INITIATIVE FOR SIMS HELP US?

- Help to hear the voice of the small programs with their specificities and to help engage SIMS in the dialogue with LIMS;
- To help establish a European strategy that can help to establish an individualized and comprehensive national policy and strategy for radioactive waste management, including provisions for ensuring the further development of technical and regulatory criteria for managing large amounts of NORM waste;
- To help SIMS direct a real support to capacity building so needed in areas as RW characterization, from the operator perspective and from the regulator perspective;
- To encourage the preparation of guides and regulations to specific areas like RW management facilities and decommissioning;
- To encourage the review of the current capacities for management and disposal of RW and establish arrangements to ensure that sufficient capacity is available and maintained for the future.



Thank you for your attention!