



**Workshop on “Supporting European Member  
States in responding to and reporting on the  
EU Waste Directive”**

**Luxembourg, 4-5 December 2013**

**“Management of  
radioactive waste and spent fuel, in Greece”**

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# CONTENT of PRESENTATION

## ➤ Preliminary elements of the

## Lead Document and current status of the EC Dir 2011/70 implementation



## RS, RW and SF in Greece

- **Greece does not manufacture – produce sealed radioactive sources**
- **Greece does not operate and does not intent to operate NPP**
- **A research reactor**



# The Greek Research Reactor (GRR-1) at NCSR “Demokritos”



5 MW

Open pool type

MTR-type fuel elements

Be reflector

Material of PCS is Al

Low enrichment uranium  
(19.75%)

First criticality 1961

**Not in operation –  
SHUT DOWN (since 2004)**

**Only irradiated fuel exist in GRR-1**

**All spent fuel has been shipped to US DoE in 2005**

## RS, RW and SF in Greece

- Greece does not manufacture – produce sealed radioactive sources
- Greece does not operate and does not intent to operate NPP
- A research reactor
- **1 facility for F-18 production (FDG for PET medical imaging)**
- **Applications with RS**



## ➤ Applications with RS :

- Medical telerherapy : 9  $^{60}\text{Co}$  units (300 TBq – 8 kCi each)
- Medical brachytherapy : 8 HDR  $^{192}\text{Ir}$  (370 GBq) & 2 MDR  $^{137}\text{Cs}$  (3.7 GBq)
- Blood irradiators : 12  $^{137}\text{Cs}$  (55 TBq each)
- Industrial irradiator (sterilization) :  $^{60}\text{Co}$  10,000 TBq (250 kCi)
- Industrial radiography : 30 companies (2-4  $^{192}\text{Ir}$  and/or  $^{75}\text{Se}$  sources - each)
- Well logging gauges : 100 Am/Be (1.5 GBq each)
- Industry : 790 sources (3, 4 and 5 category)
- Research : 1100 sources (mainly of 4 and 5 category)
- Calibration & check sources : 1  $^{60}\text{Co}$  unit 150 TBq, 1  $^{137}\text{Cs}$  740 GBq, several 4 and 5 category



## RS, RW and SF in Greece

- Greece does not manufacture – produce sealed radioactive sources
- Greece does not operate and does not intent to operate NPP
- 1 facility for F-18 production (FDG for PET medical imaging)
- A research reactor
- Applications with RS
- **Small number of Pu-Be and Am-Be neutron sources (in use)**
- **NORM**
- **Lighting rods and smoke detectors (installed or stored)**
- **Orphan sources detected at borders and scrap dealers**
- **Military objects (with  $^{226}\text{Ra}$  for luminance)**
- **Depleted U**



### ➤ **Radioactive waste & sources stored at NCSR “D” (GRR-1 building & Interim Storage Facility)**

- Radioactive materials and contaminated objects (mainly from the past operation of GRR-1, e.g. resins, activated metal parts)
- Liquid Waste in tanks
- Contaminated biological waste in concrete
- Pu contaminated soil
- Disused sealed radioactive sources in gauges
- Lighting rods and smoke detectors



## Potential & Future RW in Greece

- **RS in use** : In the worst case scenario that all envisaged solutions fail (e.g. exported to manufacturer or to recycling facility, etc), RS will need to be managed and therefore to be considered as potential (future) waste.
- **Special cases** (i.e. teletherapy ALCYON Co60, availability of transport containers for HASS blood irradiators, end-of –life sources, etc)
- **Lighting rods and smoke detectors**
- **Orphan sources in scrap metal**
- **GRR-1 decommissioning**
- **Decommissioning of facilities, including interim storage facilities**  
e.g. NCSR “D”, F-18 cyclotron, lighting rods, etc
- **NORM**



# Main “key-role players” in RW and SF management

## 1. Greek Atomic Energy Commission

- ✓ GAEC is the **national competent authority**, responsible for radiation protection, nuclear safety and nuclear security.
- ✓ It is an **autonomous public service** whose primary mission is the protection of the public, workers and the environment from ionising and artificially produced non-ionising radiation.
- ✓ GAEC was founded in 1954 and re-established in **1987**. It is supervised by the General Secretariat for Research and Technology under the Ministry of Education, Lifelong Learning and Religious Affairs.



# Greek Atomic Energy Commission : Duties

## ✓ Regulatory and legal duties

- Development of the national regulatory and legal framework
- Harmonization of the national legislation with the European and Int'l
- Follow-up of International Conventions (CPPNM, CNS, JC-MRWSF)

## ✓ Inspection and Licensing duties

- All facilities using – operating radiation systems – **sources** (medical, industrial, research, educational, etc)
- **Import – Export** of radioactive sources - materials
- **Transport** of radioactive sources – materials (including radiopharmaceuticals)
- Environmental radioactivity monitoring
- **Management of radioactive waste and DSRS**

## ✓ Personnel Dosimetry Services for occupationally exposed workers

## ✓ Operation of calibration laboratory

## ✓ Management of orphan sources

## ✓ Radiological emergency

## ✓ Education and research duties



## Main “key-role players” in RW and SF management

### Greek Atomic Energy Commission

**IAEA IRRS mission : May 2012**

- full scope (except GRR-1)
- including RW and SF management

Two IAEA expert missions (May 13 & Sep 13) for RW and SF management , under IAEA Mediterranean project INT 9176

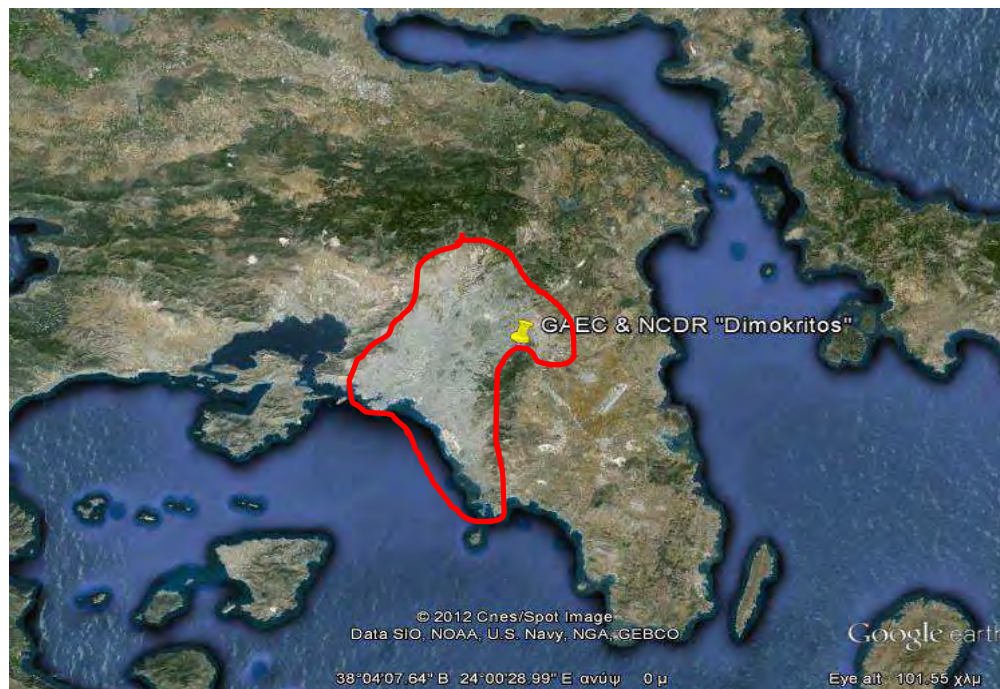


# Main “key-role players” in RW and SF management

## 2. Nuclear Center for Science and Research “Demokritos” (NCSR “D”)

**GRR-1 operator**

**Operator of a interim storage facility**





## Main “key-role players” in RW and SF management





## Main “key-role players” in RW and SF management





# Main “key-role players” in RW and SF management

## 3. All users / facilities

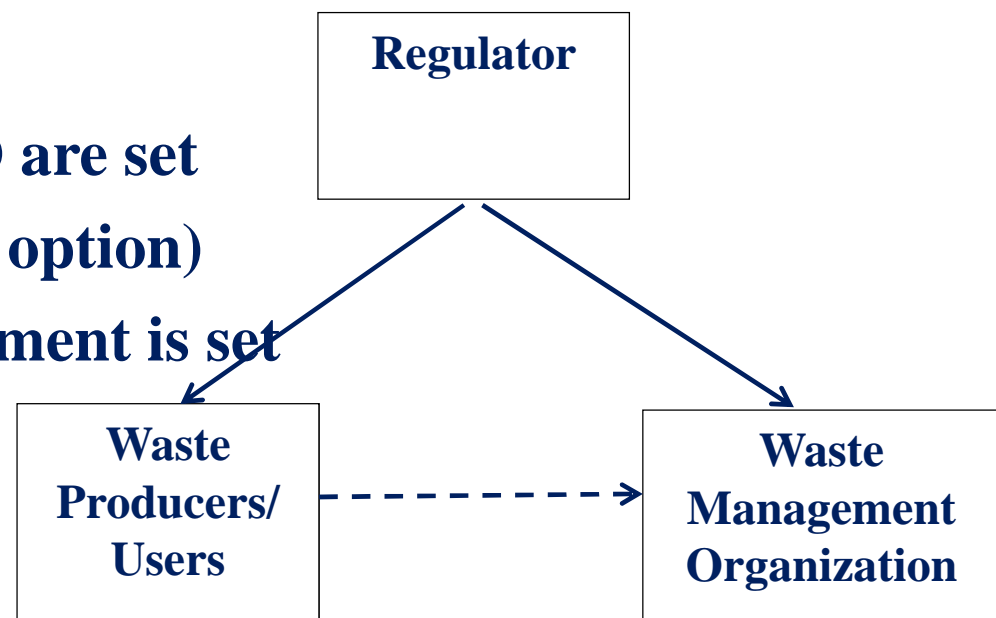
✓ According to the legislation, the users that produce waste (e.g. nuclear medicine labs, etc.) or the source holders have **the prime responsibility** for their waste management. This responsibility is **part of the license**.



# Main “key-role players” in RW and SF management

## 4. Waste Management Organization (WMO)

- **WMO has not been officially appointed, yet**
- **Establishment of the WMO (3 options are considered) :**
  - NCSR “D” (main polluter – operator of GRR-1 & storage facility)
  - Independent-new organization, e.g. in Ministry Environment, Energy and Climate Change
  - Merging the two options
- ✓ **Responsibilities of the WMO are set**
- ✓ **Funding: public (only viable option)**
- ✓ **Dead-line for WMO appointment is set**



# Main “key-role players” in RW and SF management

## 5. Public

- Joined Ministerial Decision 3711/2021/**2003** refers to the **public** information and participation on the assessment and approval of the Environmental Impact Study and the Environmental Terms and Conditions
- **GAEC informs** the public in the fields of its competence. Information to the public is made available in accordance with national legislation and international **obligations**
- Presidential Decree No 122 on EC Dir 2011/70 / 12.08.**2013** statements are made regarding the **ministerial responsibility** for transparency
- **Planning** of legal provisions regarding the transparency policy



# Current practices on RS and RW management

- No disposal facility in Greece
- Decay storage on site and clearance
- Storage on site and export
- Storage in NCSR “D” interim storage and export
- User / facility has the prime responsibility for RS and RW management (up-to-end)
- RS import prerequisites : legal document from RS **manufacturer** that accept the **repatriation** of the RS & legal document from **facility** that undertakes all financial and administrative **provisions** for RS repatriation

**However, a clear pre-defined strategy for RW with up-to-end management solutions needs to be developed**



# **Greek Atomic Energy Commisison (GAEC) maintains the National Registry of all radioactive sources, including RW and SF (which is part of the National Database)**

- Licensee – Source holder : facility / laboratory / organization
- Person in charge : Radiation protection officer / advisor or source officer
- License : expiration - conditions
- Location within the facility
- Source device: manufacturer, type, etc.
- Source or RW isotope, type – form, container, etc
- Source activity and reference date
- Other available information from the licensee

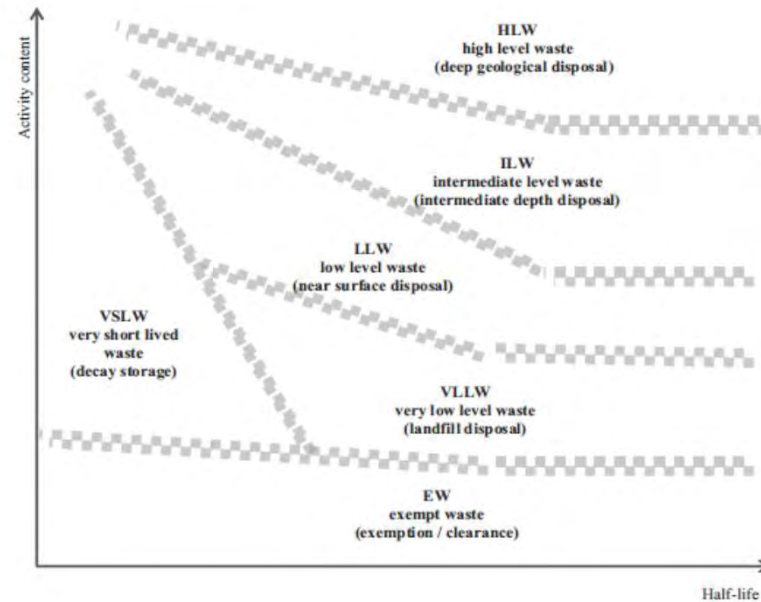
## Agreements with other countries

The users of the **radioactive sources** are obliged to get a commitment from their suppliers/manufacturers as part of the purchase agreement to take back the disused sources.

NCSR, "D" and US DoE agreement for taking back the **spent fuel** from the research reactor : all spent fuel must be discharged from the reactor prior to May 13, 2016 and that DoE shall not accept material after May 12, 2019.



# Waste classification system



**IAEA No. GSG-1, 2009 is followed, in general.**

**Waste classification should be considered according to the available storage and disposal options by RW producers (and WMO)**



## BASIC National instruments

LEGISLATIVE PRESIDENTIAL DECREE (**LAW**) 181, Folio No: 347  
**“PROTECTION AGAINST IONIZING RADIATION”** November 20, **1974**

MINISTERIAL DECISIONS No. 1014 (FOR) 94, Folio No. 216B  
APPROVAL OF **RADIATION PROTECTION REGULATIONS** March 6, **2001**

MINISTERIAL DECISION No. 10828/(EFA)1897, Folio No. 859  
CONTROL OF HIGH-ACTIVITY SEALED RADIOACTIVE SOURCES AND ORPHAN  
SOURCES (**HASS**), July 10, **2006**

MINISTERIAL DECISION No. 112/305, Folio No. 2877  
**NUCLEAR SAFETY REGULATIONS FOR GRR-1**, Oct 12, **2012**

PRESIDENTIAL DECREE 112/305, Folio No. 177 (**PD-122**)  
TRANSPOSITION INTO GREEK LEGISLATION THE **EC DIRECTIVE**  
**2011/70/EURATOM**, “ESTABLISHING A COMMUNITY FRAMEWORK FOR THE  
RESPONSIBLE AND SAFE MANAGEMENT OF SPENT FUEL AND  
RADIOACTIVE WASTE” (22 AUG 2011), Aug 12, **2013**



## **National Policy – Main elements (PD122)**

- **Disposal is allowed only for RW produced in Greece**
- **Until the establishment of the disposal facility the waste shall be stored in authorized interim storage facility**
- **SF is returned to the manufacturer or supplier country, according to applicable agreements.**

## Foreseen legal and regulatory framework - National Infrastructure

**According to the Presidential Decree PD-122/12.08.2013, an additional PD and a number of JMD are foreseen, regarding**

- System of licensing, oversight, enforcement
- Allocation of responsibilities (organizations, bodies, etc)
- Financing scheme(s)
- Public information and participation

# National Programme

- ✓ **Defines, among others:**
  - Milestones and time frame
  - Inventory
  - Concepts or plans for technical up to end solutions
  - Cost estimate
  - Financing scheme
  - R&D
  - Transparency policy and public information
- ✓ **The national program will be established by the WMO and shall be communicated to the EC until 23 August 2015**
- ✓ **Proposal of the preliminary National Program is currently being undertaken by GAEC until the WMO is established**



# Example of Milestones and time frames

## 1. Major Milestones and Time Frame regarding the Waste Management Organization (WMO) establishment`

	Activity	2013				2014				2015				2016				2017				2018			
1.	WMO establishment																								
1.1	Selection of Organization																								
1.2	WMO establishment																								
1.3	Fully operation of WMO																								
1.4	Cooperation WMO with Waste Producers																								
1.5	Milestones and time frames																								
1.6	Submission and approval of Nat Program																								
1.7	Waste inventory																						>		
1.8	Plans and technical solutions																						>		



# Example of Milestones and time frames

## 2. Major Milestones and Time Frame regarding the NCSR “D” interim storage facility (ISF) operation

Item	Activity	2013				2014				2015				2016				2017			
2	ISF operation & Licensing																				
2.1	Licensing procedures (legislation)																				
2.2	Finance for ISF upgrade																				
2.3	Upgrade of ISF																				
2.4	Physical protection of ISF																				
2.5	WAC : establishment, submission &approval																				
2.6	Clearance procedures : submission &approval																				
2.7	Program for waste disposal, incl. export																				
2.8	Implementation of source export, 1 <sup>st</sup> round																				
2.9	ISF operation license																				

# Conclusions

- **RS, RW and SF management is being implemented in a safe and secure manner**
- **The national strategy for RW management with up-to-end management solutions is under development**
- **Highest priority to the WMO establishment**
- **High priority to complete the legislation and issue of regulations and guides**







**Thank you for your attention**

