



KINGDOM OF MOROCCO



Moroccan Experience in recovery, conditioning and secure storage of Radium 226 sources

National Centre for Radiation Protection

Ministry of Health

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Regional Technical Meeting on the Implementation of the Code of Conduct on the Safety and Security of Radioactive Sources with Regard to Long Term Strategies for the Management of Disused Sealed Radioactive Sources (DSRS).

Vienna, Austria from 27 February to 1 Mars 2012



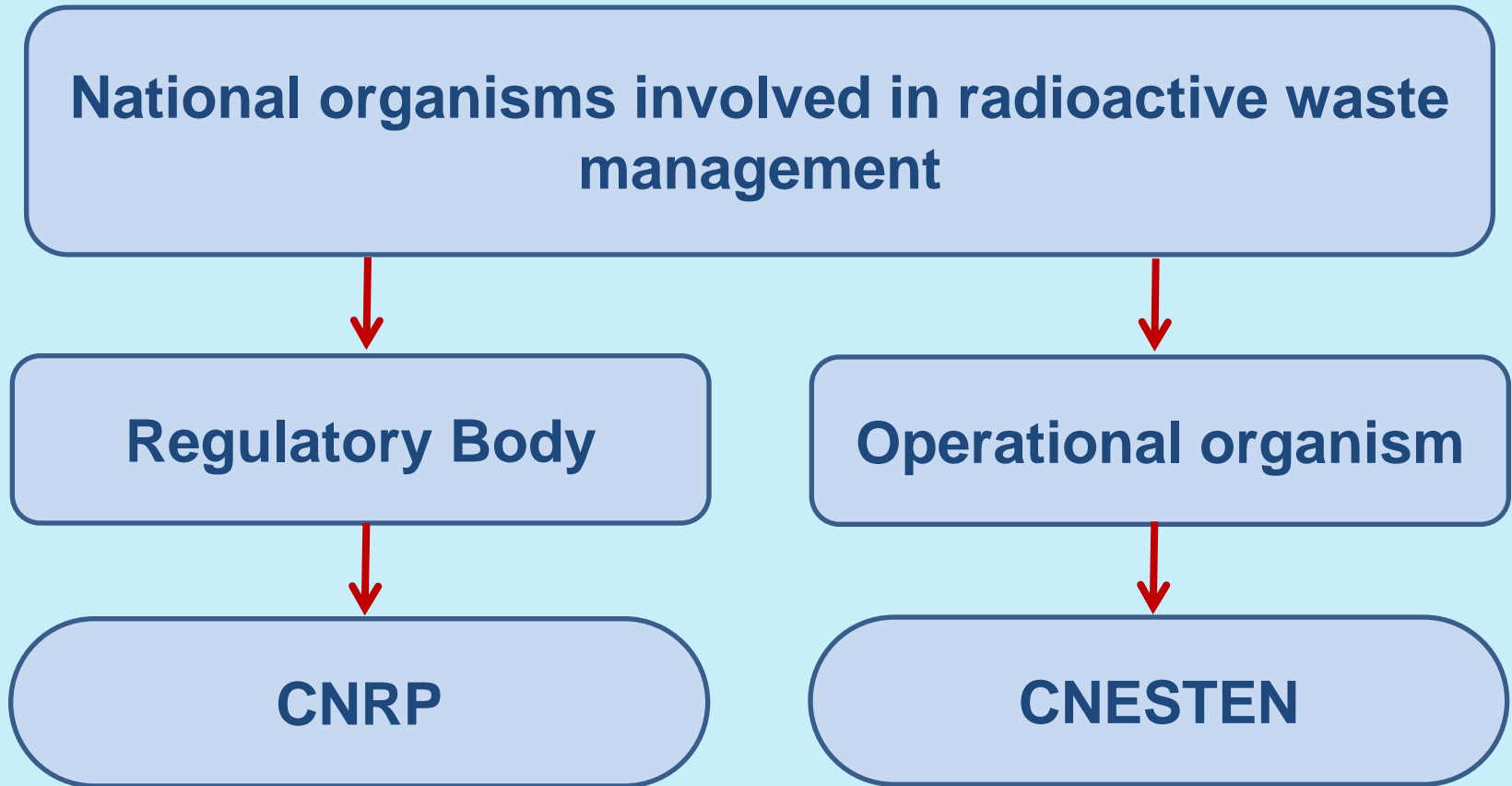
Structure of the presentation

- **Outline of the Long Term Strategy for the Management of Disused Sealed Radioactive Sources (DSRS)**
- **Moroccan experience in recovery, conditioning, and secure storage of Radium 226 sources**



Moroccan Experience in recovery, conditioning and secure storage of Radium 226 sources

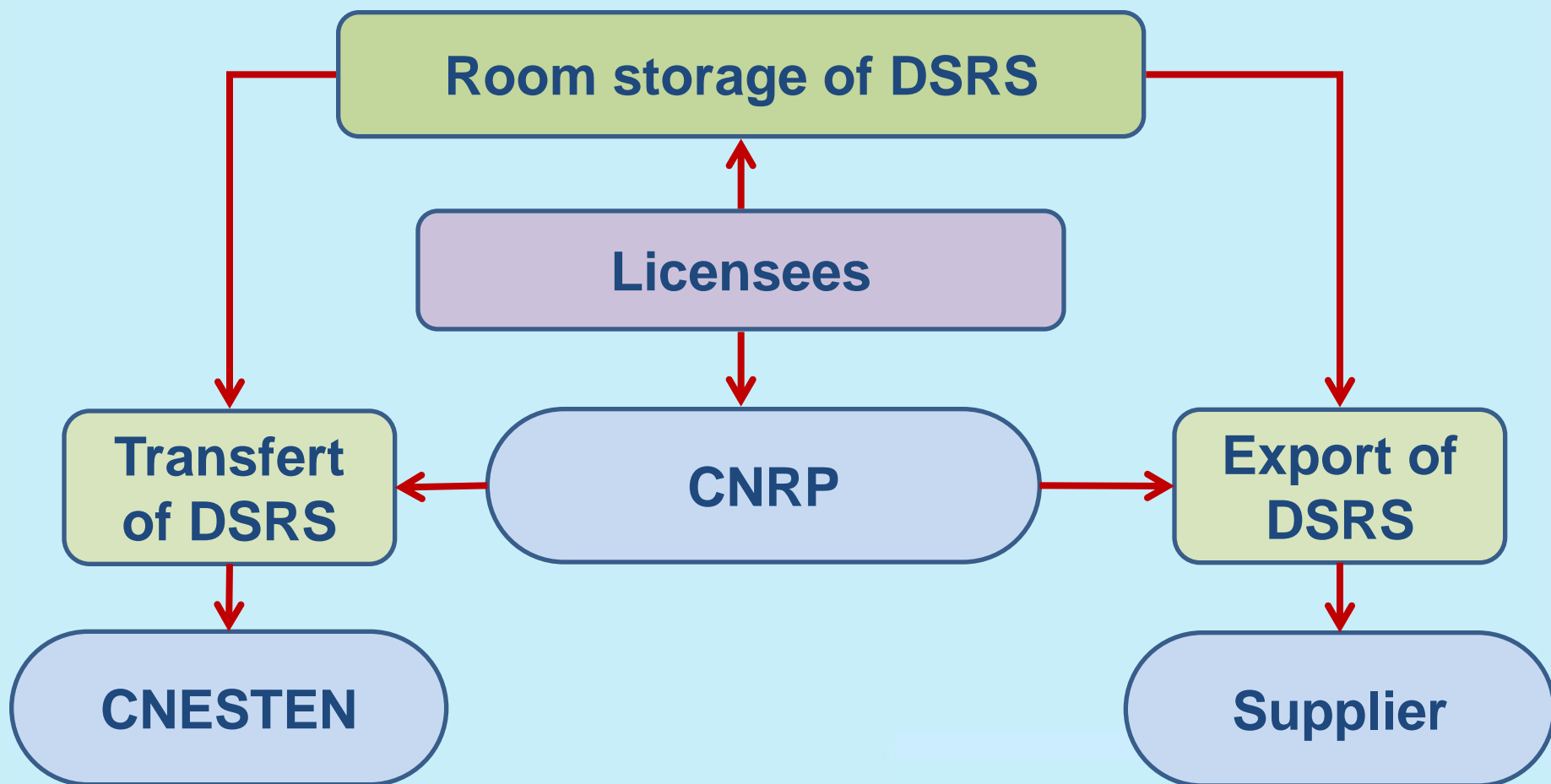
National strategy in managing DSRS





Moroccan Experience in recovery, conditioning and secure storage of Radium 226 sources

National strategy in managing DSRS





Moroccan Experience in recovery, conditioning and secure storage of Radium 226 sources

- The radium-226 sources purpose of this experience were used in the past in medical treatment.
- These radium needles were recovered and conditioned with the assistant of IAEA and NECSA from South Africa under AFRA project related to the radioactive waste management.
- This operation concerned 91 radium-226 sources.
- 66 needles contained in a gammathec were temporary stored at the user's site (Oncology Centre) in a bunker without any door providing access to the sources. The only access to these sources was a trapdoor on the roof of the bunker
- The 25 other radium needles, which were previously collected by the CNESTEN to their owners, were transported to the Oncology Centre in order to be conditioned.





Moroccan Experience in recovery, conditioning and secure storage of Radium 226 sources

Type of sources	Activity	Quantity	Total activity (Estimated)	Place of storage
Needles of Ra-226 (Container n°1)	30 mg	1	30 mg	National operator of waste management (CNESTEN)
	1 mg	10	10 mg	
	2 mg	7	14 mg	
Tubes ; Ra-226 (Container n°2)	5 mg	5	25 mg	
Sources of Ra-226 (Pot n° 1, 2)	---	2	---	
Needles; Ra-226 (Gammathec)	---	66	---	Holder (COIR)
Total of sources		91		





Moroccan Experience in recovery, conditioning and secure storage of Radium 226 sources

Preparation of the room destined for the conditioning operation

An adjacent room to the bunker was prepared to the conditioning operation.

- A system of air filtration based on an activated charcoal filters with an efficiency rate 99.9%
- Table1, for manipulating radium needles, equipped with a hood and a lead shield provided in its upper part with a leaded glass slightly inclined, with a thickness of 10 cm, enabling a direct view of the needles to handle
- Table 2, for the welding of the capsules, equipped with a semi-automatic welding system and control of welding quality of the capsules, it is also equipped with a lead shield.
- Capsules in stainless steel.
- The shields.





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Preparation of the room destined for the conditioning operation



Equipment of conditioning room (cont):

- Two source holders entirely in lead in the form of solid cylinder, weighing 200kg each and whose dimensions are: 24 cm in height and 27cm in diameter.
- Each capsule holder contains seven boxes with their covers in which the capsules will be placed.
- The whole of the room and work tables are covered with a plastic to avoid any risk of contamination.
- The protective clothing (suits, masks ...).
- Means for remote handling of the needles and capsules.
- Means for measuring and detecting radiations.



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Radiological control of the Bunker

Before demolishing a part of one wall of the bunker to reach the gammathec, and in order to avoid any potential exposure, the team has carried out checks around the walls of the bunker including inside through the trapdoor so as to assess external exposure to ionizing radiation and internal exposure due to radon.

Measuring rate of radon

Place		activity concentration (Bq/m ³)	Observation
Bunker	Before opening the wall of the bunker	196.1	No radioactive emanation ⁽¹⁾

(1) = Taking into account the background.

Measurement of equivalent dose rates around the bunker

Place	H (mSv/h)	Observation
at the level of the trapdoor	0.011 (Max)	No radiation risk
Around the walls of the bunker	0.004 (Max)	





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Demolition of a part of the wall of the bunker

When the wall opening was performed, a contamination control was carried out on the gammathec, on the inside of walls of the bunker and on the debris of demolished wall.

Contamination monitoring

place	Measured value (c/s)	Observation
Bunker	27	No radioactive contamination
Gammathec	33	
Debris	27	

N.B: The background is about 20 c/s

Measuring the rate of radon

Place		activity concentration (Bq/m ³)	Observation
Bunker	After opening the wall of the bunker	98	No radioactive emanation



Taking into account this result, the gammathec was moved to the room used for conditioning. Two pots containing two radium needles with wires were stored in the storage room of iridium 192 wires were moved to the conditioning room as well as 25 pots containing radium needles collected by CNESTEN



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Moving the gammathec to the conditioning room

Upon the arrival of these sources to the conditioning room, a control was conducted to assess the risk of contamination and exposure.

Contamination monitoring containers

Place	Measured value (c/s)	Observation
Gammathec	33	No presence of radioactive contamination
Pot n°1 (COIR*)	21	
Pot n°2 (COIR*)	26	
Container n°1	30	
Container n°2	24	



Dosimetric data at the level of containers

Container	Dose rate on contact (mSv/h)
Gammathec	0.8 à 8.0
Pot n°1 (COIR)	2.00
Pot n°2 (COIR)	0.70
Container n°1	6.00
Container n°2	0.7





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Recovery and Conditioning of radium needles

This operation was carried out under the hood, inside a plastic enclosure.

The recovery and conditioning operation consisted on:

- Taking out the radium needles from their containers and placing them in capsules made of stainless steel up to 1.85 GBq (50 mg) per capsule.
- Placing the capsule containing the radium needles in a container made of lead and moved it to the other table for welding.
- After welding, the welded capsule was placed under vacuum in a glycol solution in order to testing the welding quality.
- The welded capsules are then placed in two source holders for final storage.





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Recovery and Conditioning of radium needles

Monitoring of contamination of the room

Place		Measured value (c/s)	Observation
Recovery and Conditioning Room	Before operation	23	No presence of radioactive contamination ⁽²⁾ .
	After operation	26	

(2) : The background is about 20 c/s



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Preparation of waste packages

For this operation, two packages were prepared in accordance with the recommendations of the International Agency of Atomic Energy to transport the source holders:

- Each package has a capacity of 220 liters.
- These packages constitute of steel drums treated under high temperature with anti-corrosive paint and filled with concrete in which containers of source holders will be immersed and closed.





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Preparation of waste packages

Control of contamination of the waste packages

N°. Package	Measured value (c/s)	Observation
DR-02	26	No radioactive contamination
DR-03	23	

Informations related to waste packages

N°. Package	Dose rate ($\mu\text{Sv/h}$)			Date of mesure
	Container	package		
	on contact	on contact	at 1m	
DR-02	7500	350	10	19/04/02
DR-03	2000	100	6	19/04/02





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Thank you

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