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NATIONAL AND CEA STRATEGY IN MANAGING DSRS (France)

Code de la santé publique (public health law)

- **Any nuclear activity is submitted to authorisation**
  - This includes sealed sources (production, supply, use, as well as recovery and management of disused sources)
  - This includes import and export of sealed sources
- The use of sealed sources is limited in time (10 years)
  - The user is not allowed to keep a disused or outdated source
  - The supplier is under obligation to recover and manage any disused or outdated source in France, on user request

Code de la santé publique (public health law)

- The 10 year limit can be extended to 15 or 20 years; a case by case authorisation is required. The demand is prepared by the user and includes from the supplier or producer:
  - A technical advice on the source lifetime
  - A renewal of his commitment to recover the source when disused or outdated

Code de l'environnement (environment code)

- **Radioactive waste management is submitted to specific regulations**
- ANDRA is the national agency in charge of final disposal of radioactive wastes
- The producers of radioactive wastes have to store them until they can be transferred to ANDRA disposal
- A national roadmap for the management of radioactive wastes and radioactive material presents the national strategy (PNGMDR)

- Some stored radioactive materials are not considered as waste, because they have a potential for future use (this includes nuclear material such as depleted uranium, and irradiated nuclear fuel)

  These materials become radioactive waste when a decision is taken to manage them as such

- **Disposal of radioactive waste coming from outside France is not allowed**

- The status of disused sealed sources is under question and should be clarified:
  - When and how does DSRS become a radioactive waste ?
  - Which criteria for authorisation to import or export of DSRS ?

- After recovery of a sealed source by the initial supplier or by any other authorized operator:
  - A recovery certificate is issued
  - A decision is taken to recycle the source or manage the source as radioactive waste
  - Radioactive wastes have to find a route towards an existing or planned ANDRA disposal facility

Existing of planned ANDRA final disposal facilities:

<table>
<tr><th>Half-life
Activity</th><th>Short half-life
(≤Cs 137)</th><th>Long half-life
(>Cs 137)</th></tr>
<tr><td>Very Low Level (VLL)</td><td colspan="2">Surface disposal (CSTFA)</td></tr>
<tr><td>Low Level (LL)</td><td rowspan="2">Surface disposal (CSFMA) except some tritiated waste and some sealed sources</td><td>Dedicated sub-surface facility under study</td></tr>
<tr><td>Intermediate Level (IL)</td><td rowspan="2">Ongoing studies, including disposal in deap geological repository</td></tr>
<tr><td>High Level (HL)</td><td></td></tr>
</table>

- **Sealed sources have some specific characteristics:**
  - Concentrated activity (importance of criteria based on thermal power)
  - **Attractiveness**

- ANDRA has proposed **specific criteria** for acceptation of wastes including sealed sources:

- LAS is a limited activity per source, calculated on the basis of an intrusion in the disposal facility, after its closure

- As far as reasonably achievable, sealed sources are managed in specific waste packages and mixing with other wastes is avoided

ANDRA criteria for acceptance of DSRS in final disposal:

Half-life / Activity	Short half-life		Long half-life
	≤ Co 60	≤Cs 137	
Very Low Level (VLL)	< 1 Bq / source (CSTFA)		
Low Level (LL)	(CSFMA) except some tritium sources	(CSFMA) if activity < LAS(1)	(subsurface facility) if activity < LAS(1)
Intermediate Level (IL)	< 120 w(2)	(geological disposal: IL-LL) < 30 w(2)	(geological disposal: IL-LL)) < 12 w(2)
High Level (HL)	(geological disposal: HL-LL)		

(1) LAS is an activity limit / source, based on a safety analysis

(2)Thermal power is limited / container, based on a safety analysis

- CEA has been an important producer and supplier of sealed sources
- CEA is an important user of sealed sources
- **Three basic rules are followed for the management of DSRS by CEA:**

1. **Recycle the sources** when this option is technically and economically practicable:
   > Very high activity Cobalt, Cesium, Am and Be sources
   > Very rare isotopes, for some specific usages

2. **Destroy the sources** when their physical or chemical nature is inadequate for management as solid waste
   > Gaseous sources
   > Liquid sources
   > Some other specific batches of sources may be totally or partially destroyed (degraded source, aluminum parts, plastic support sources, etc.)

3. **Manage all other DSRS as radioactive waste** (small sources are grouped in closed capsules, with the objective of reducing their number), with the following objectives:
   - > Using existing facilities for conditioning sealed sources into waste packages
   - > Using existing of planned facilities for interim storage
   - > Considering irradiating properties of each batch of sources for choice of the conditioning process (ALARA principle)

- **Four main types of processes and waste packages have been chosen:**
  - **Type H**: metallic drum (1,4 m^3) [geological]
  - **Type C**: cement waste package (1,4m^3)
    - C1: medium activity, long life [geological]
    - C2: low activity, long life [subsurface]
    - C3: medium activity, short life [surface: CSFMA]
  - **Type V**: ancient transport containers (1,3m^3) included in cement package on CSFMA disposal site [surface]
  - **Type D**: metallic welded drum conditioned for 50 years interim storage (0,2m^3) [geological]

CEA strategy

	Estimated number of sources	Waste package type				Estimated activity of sources Group of sources (TBq)
		H	C	V	D	
Highly irradiating sources						
Cesium-137	9200	3	5		44	9500
Cobalt-60	6600		5	30	35	4100
Neutronic	1600		12			40
Strontium-90	62	3	4		7	550
Low irradiative sources						
Smoke detectors	400000		2			1,1
Beta gamma	80000		8			25
Cobalt-60	4500		3			0,1
Pacemakers	2500	1				200
Alpha	150		4			8
Estimated number of waste packages		7	43	30	53	
Estimated volume of waste (cubic meter)		1,4	43	40	10,6	

CEA objectives are the following:

1. Recover all sources (with priority to high activity) before 2020
2. Produce all type V and type H packages before 2016
3. Produce all type C and type D packages before 2020
4. Reference planning for sending packages to final disposal

Surface facility	30 V packages 3 C1 packages	2014-2023
Subsurface facility	7 C2 packages	2020-2030
Geological facility	7 H packages 33 C3 packages	2030-2040
	53 D packages	2055-2065

I thank you for your kind attention

I remain at your disposal to answer to your questions and listen to your comments

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