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New Developments in LLW Management in Spain

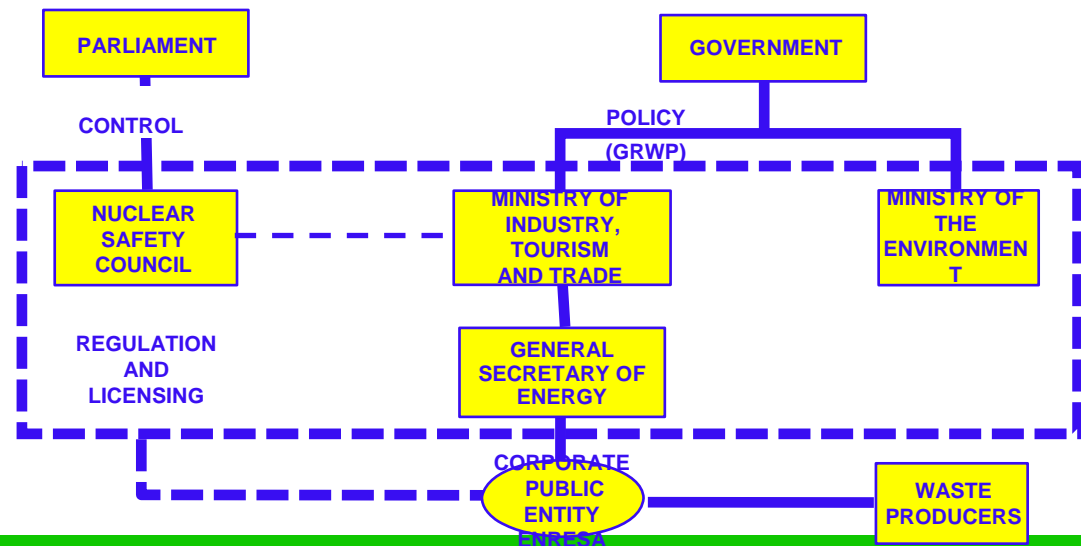
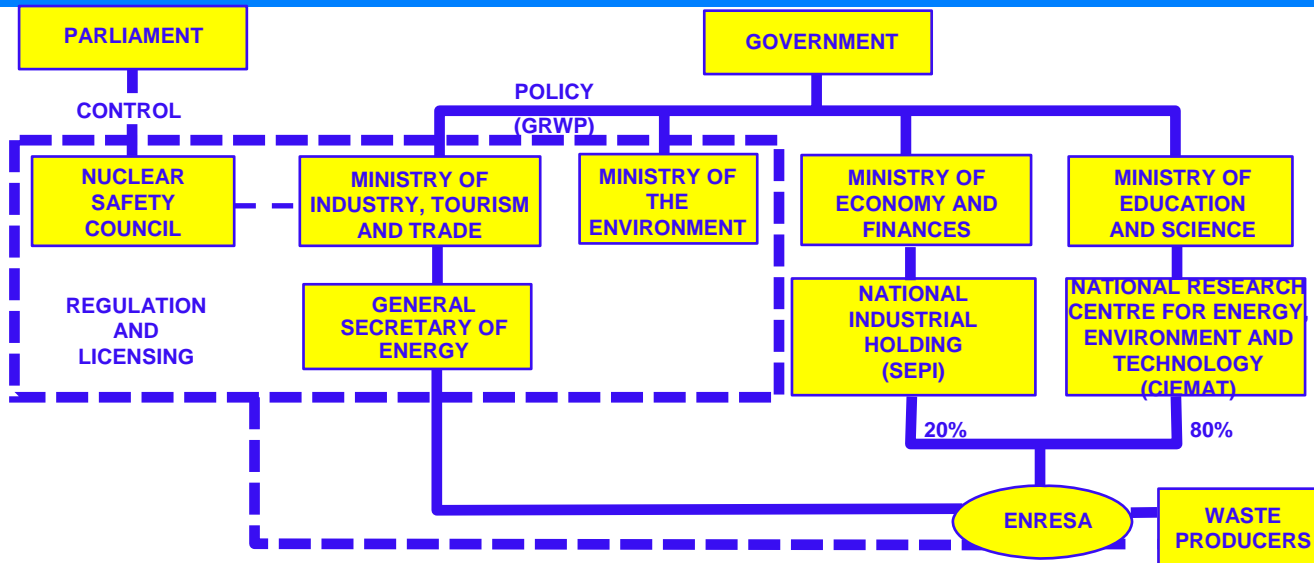
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Nuclear Fuel Cycle Facilities in Spain



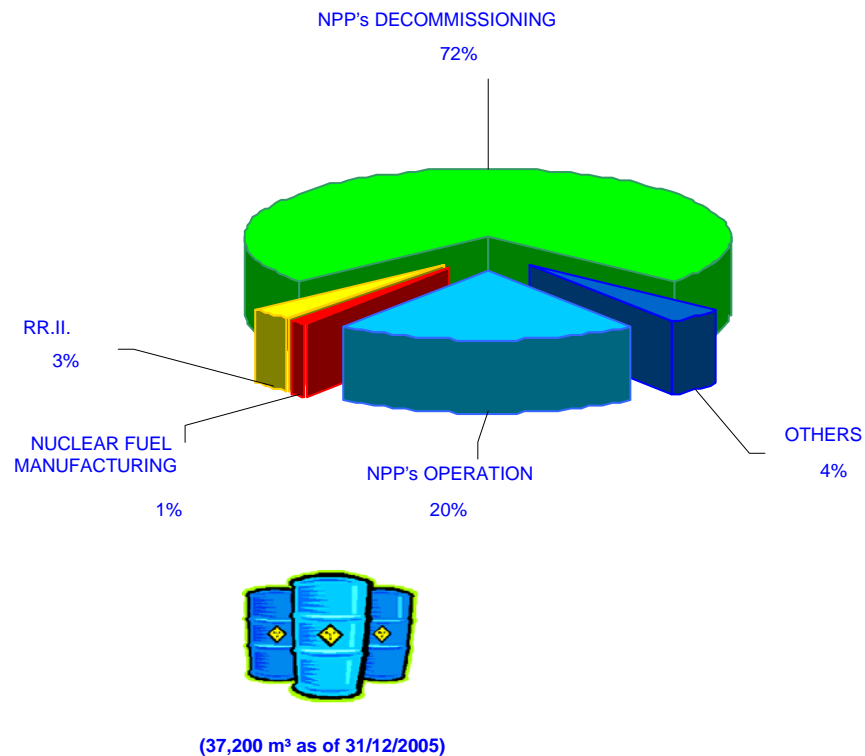
Radioactive waste management organisation



Estimated Waste Volumes 6th GRWP

LILW \cong 176,300 m³

SF/HLW
12,800 m³



LILW = Conditioned low and intermediate level waste (included very low level waste)
 SF/HLW = Spent fuel and high level waste in disposal canister (included medium level waste)
 NPP's = Nuclear Power Plants
 RR.II. = Radioactive Installations

LILW Management: ENRESA's scope



Siting, Design and Construction of Required Installations



Acceptance and Characterisation of Waste



Collection and Transport



R&D



Treatment and Conditioning
•Generally by NPP
•In some streams and Ins.Waste by ENRESA



Final Disposal



Support in Incidents, etc.



New developments

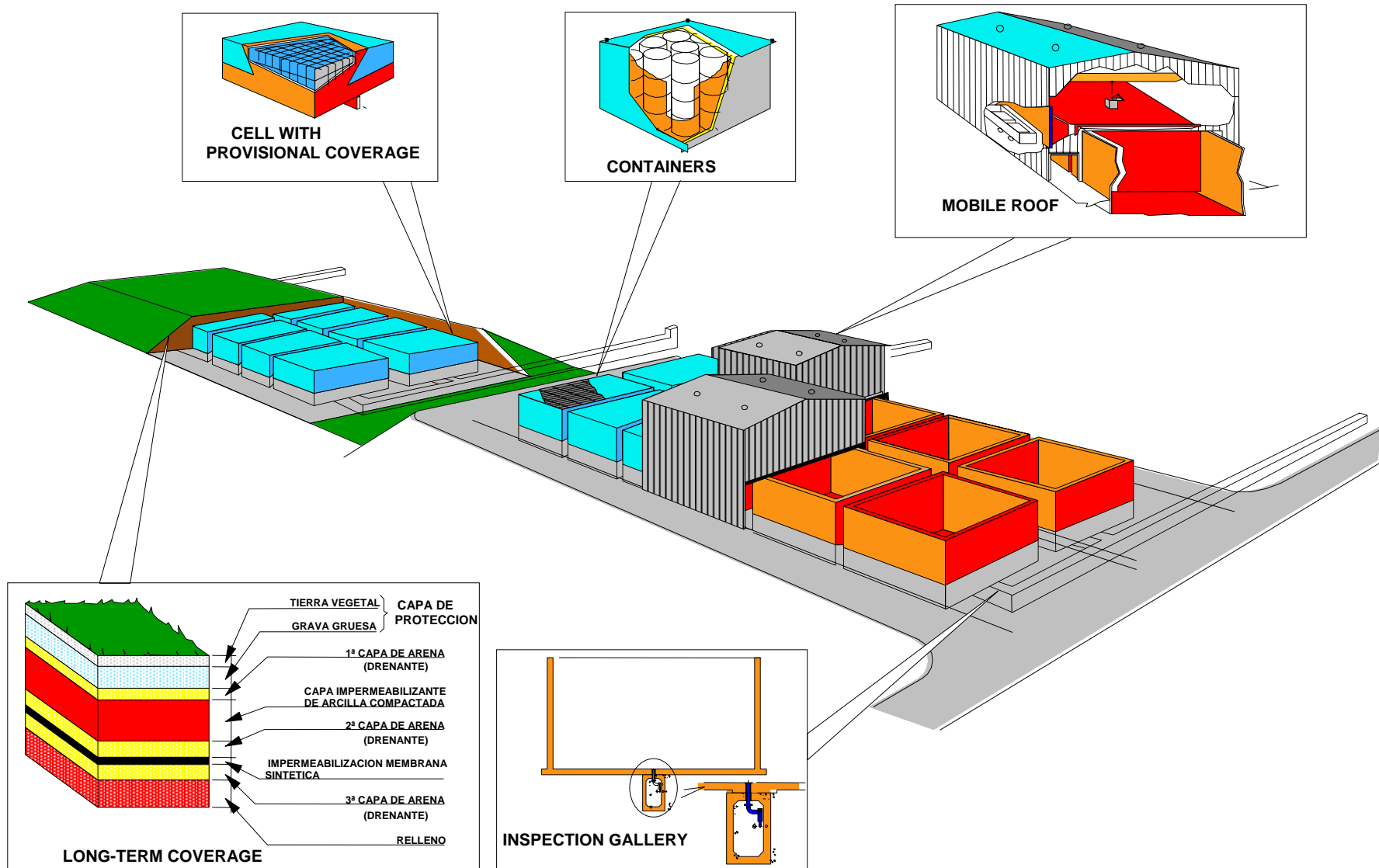
El Cabril Disposal Facility: objectives



Objectives of the facility:

- **Final disposal**
- **Interim Storage**
- **Treatment and conditioning**
- **Characterisation and Verification**
- **Fabrication of containers**
- **Auxiliary installations**

El Cabril Disposal Facility: conceptual design



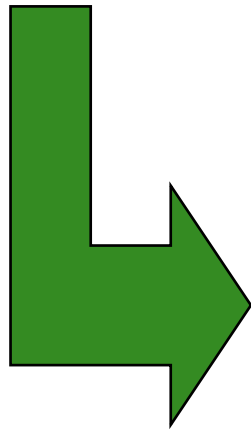
El Cabril Disposal Facility: disposal zone (Northern platform)



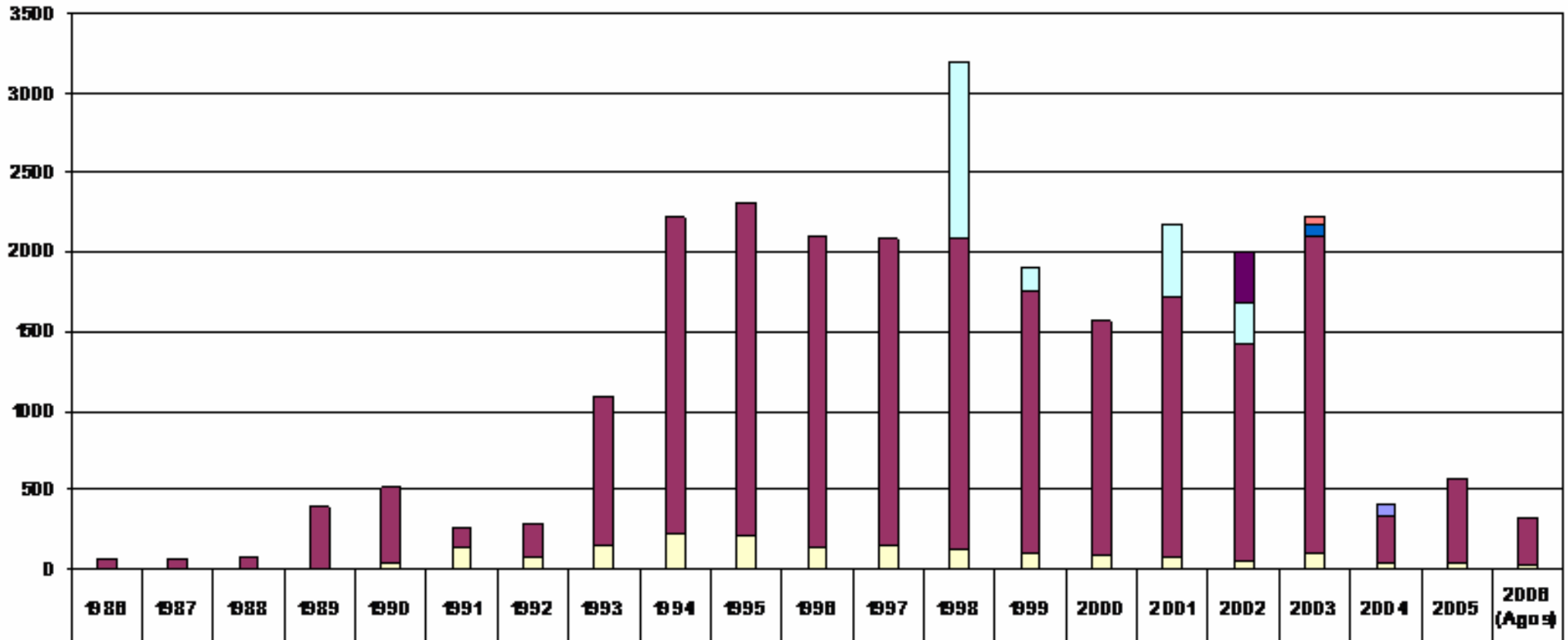
**Total internal volume of 28 vaults: 100,000 m³
providing room for 8960 containers.
Occupied volume (June 2006): 54%**



- Primary packages disposed of (June 2006): 98548 (23074 m³)
 - 95800 220-L drums
 - 63% solidified waste
 - 37% compactable
 - 1920 480-L drums
 - 828 1.3-m³ boxes

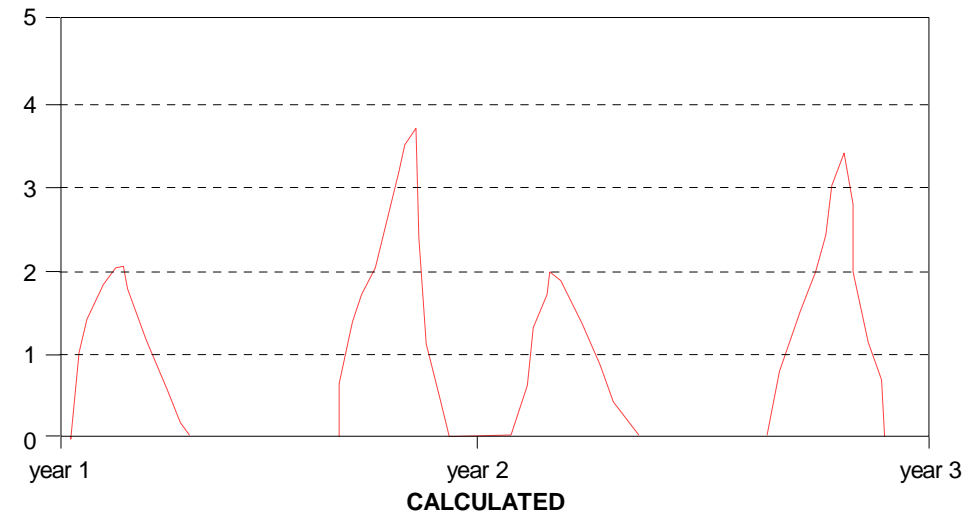
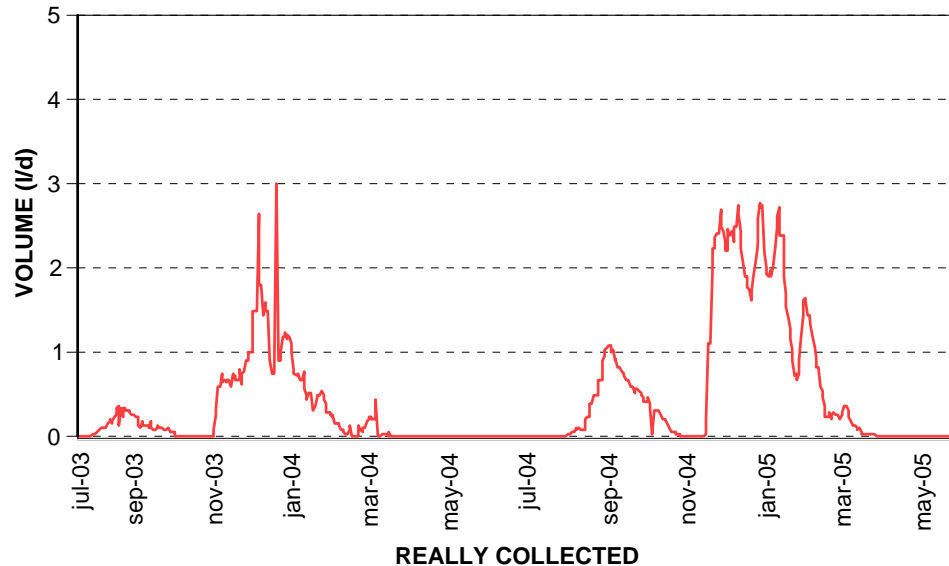


El Cabril Disposal Facility: operational experience



- Waste reception rate (metres cube/year)
- No significant events
- Water collected

El Cabril Disposal Facility: water collection in the seepage system



- **Collection of small amounts of water in the seepage system**
 - Two seasonal events; summer collection (No rain, low water) Investigation and tests
 - Including flooding of closing slab and construction joints
- **Modelling: Good correspondence to data**
- **Condensation of evaporated water due to thermal differences in connection with capillary rise**

El Cabril Disposal Facility: treatment and conditioning



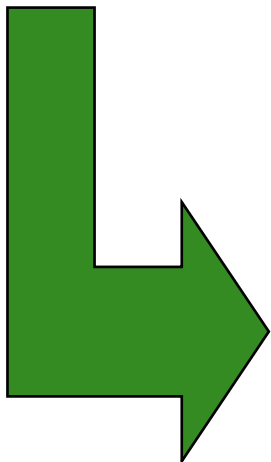
Conditioning building



Super-compaction



Incineration of solids and liquids



Leaching and electrolysis of ashes



Drums, pellets and boxes conditioning



Grout injection

El Cabril disposal facility: interim storage

- **Additional interim storage needs:**
 - Incidents in non-nuclear industry
 - New VLLW category
 - Spent Sealed Sources and other LLW not authorised for disposal
- **Storage capacity**
 - Existing capacity: reception building, conditioning building, three storage buildings
 - New VLLW treatment and storage
 - Auxiliary building with storage, treatment and verification equipment
 - Use of disposal vaults for storage

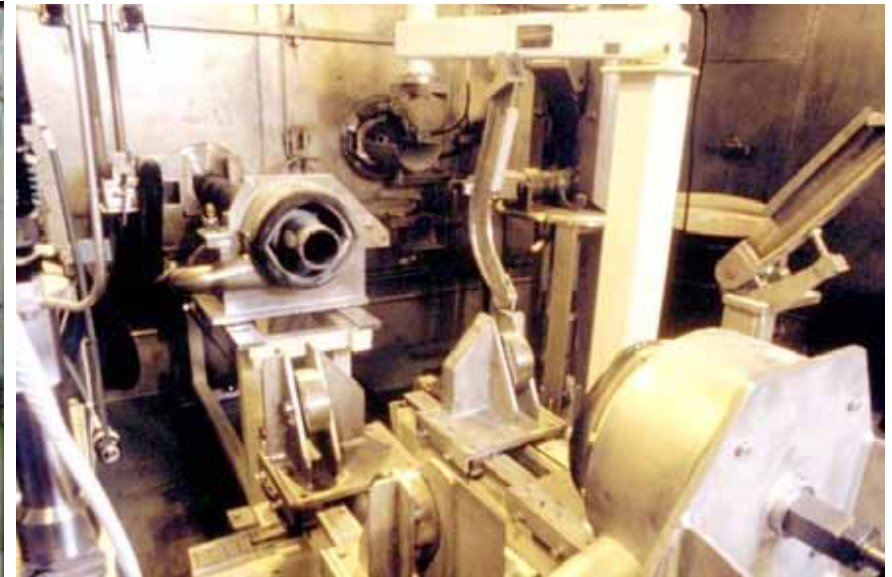


- **Waste acceptance criteria development:**
 - Final packages acceptance criteria modifications subject to CSN approval.
 - Designed and tested to durability, functional, stability, transport and confinement (in some cases).
 - Primary packages spec. by ENRESA
 - Level 1 and 2 tests according to activity.
 - Increase of verification tests for level 2 waste, focused on activity determination
 - Acceptance criteria for VLLW in licensing process.



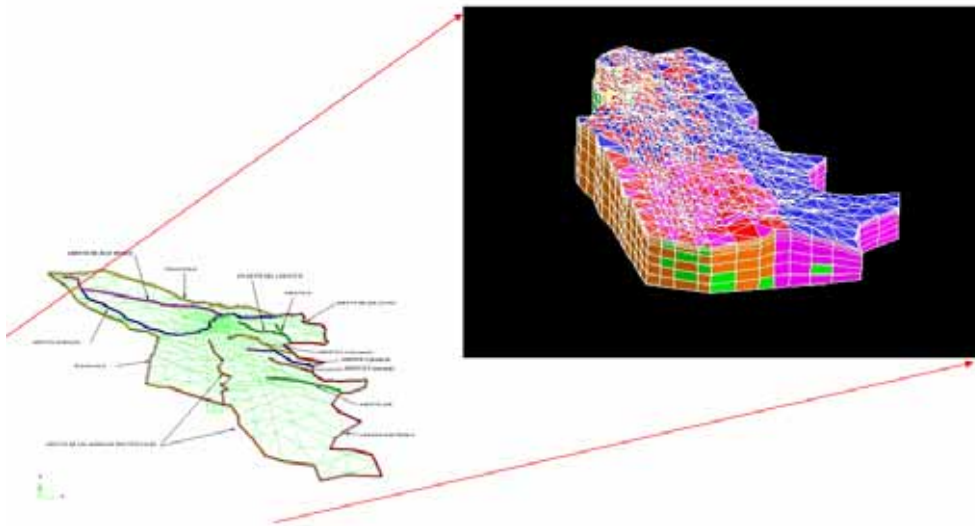
Waste acceptance and characterisation

- The producer is responsible for establishing the conditioning method, the industrial control of packages production and measurement of key gamma nuclides.
- ENRESA performs and evaluates the characterisation tests, carries out production controls at producers' sites and verification tests at El Cabril Laboratory. Also studies on alpha content and scaling factors for nuclides difficult to measure



Improvement of safety assessment

- **Licensing requirements**
 - Periodic safety review, including improvements on safety assessment
 - Following up and evaluation of features related to safety
- **Main aspects:**
 - Based on last international trends (ISAM)
 - Systematic analysis
 - Conservative but realistic assumptions
 - Deterministic approach
- **Main components**
 - Context
 - System description
 - Scenario generation and justification
 - Model implementation
 - Analyses of consequences
 - Sensitivity and uncertainty analyses
 - Results and conclusions
- **R+D Programme supporting**



- **Characterisation techniques:** Other nuclides; Very low activity
- **Knowledge of components**
 - Waste form behaviour and interaction
 - Concrete barriers behaviour
 - Site
 - Engineered cap development
- **Instrumentation and modelling**
- **Treatment and conditioning:** Volume reduction (Plasma); New waste types

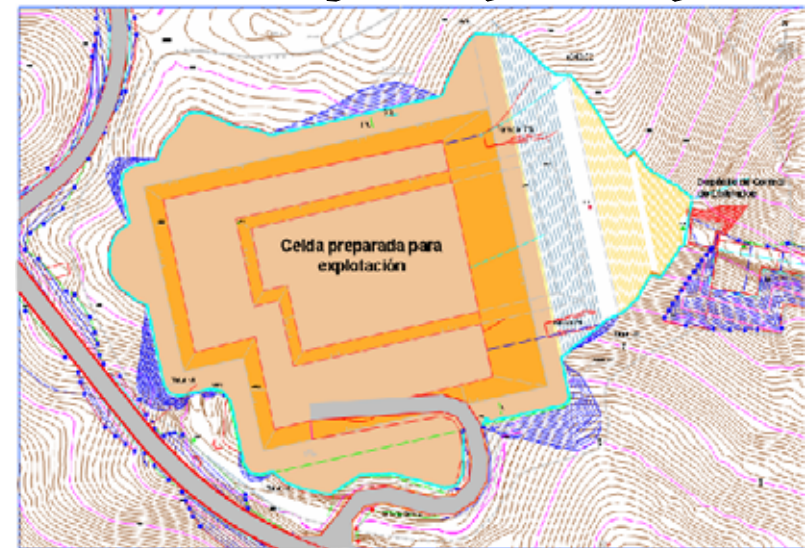
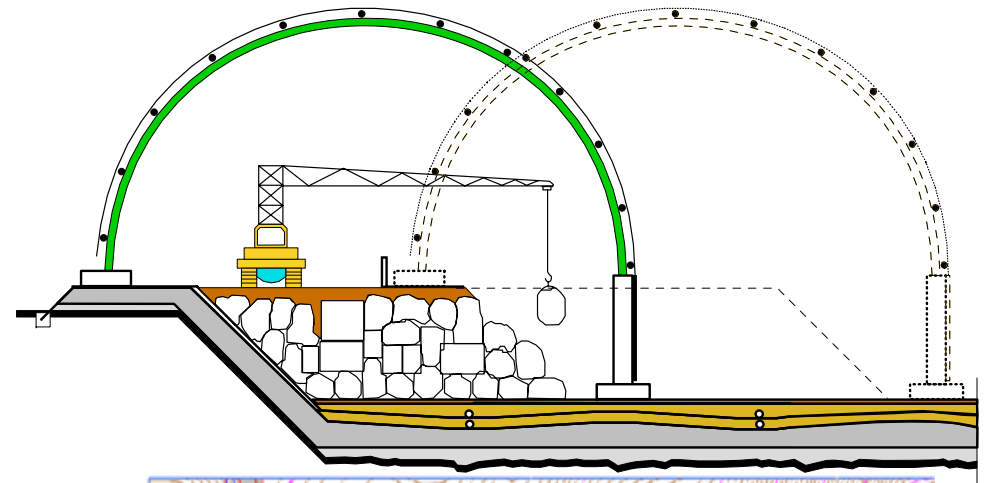
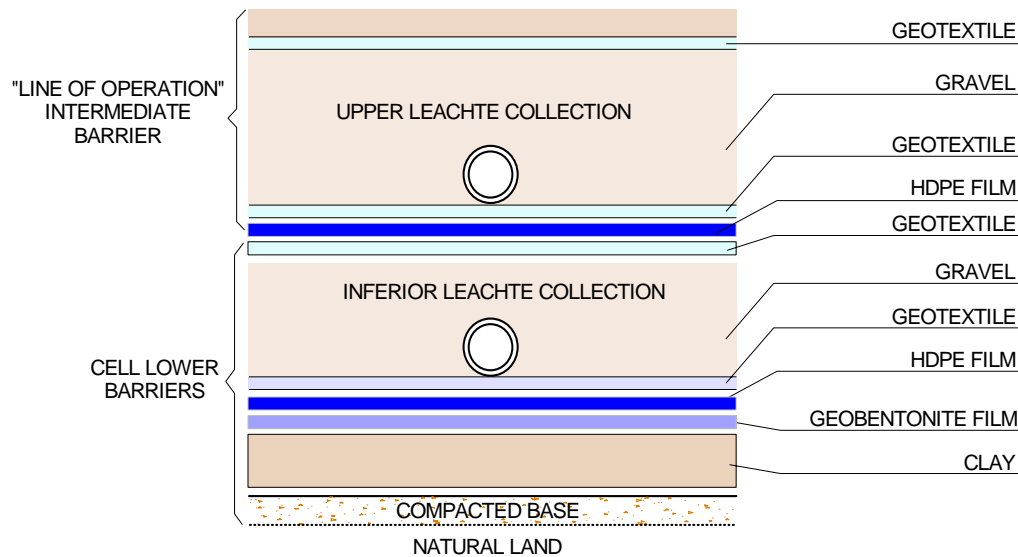
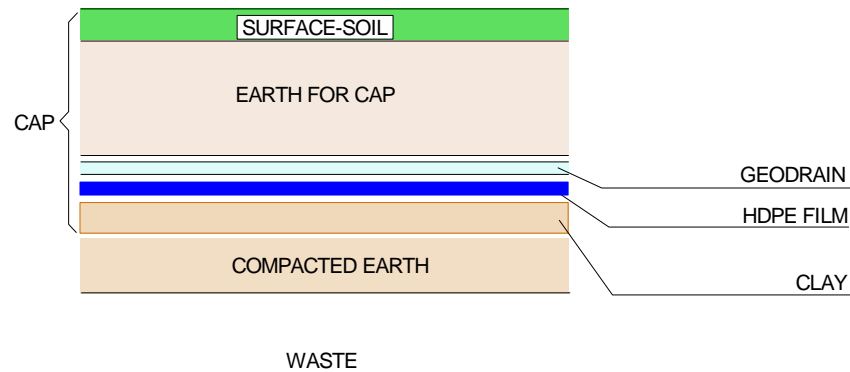
El Cabril: Existing facility and VLLW disposal area



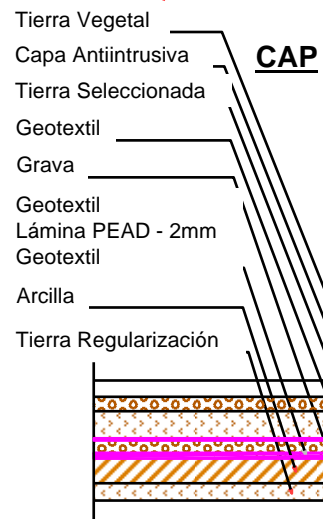
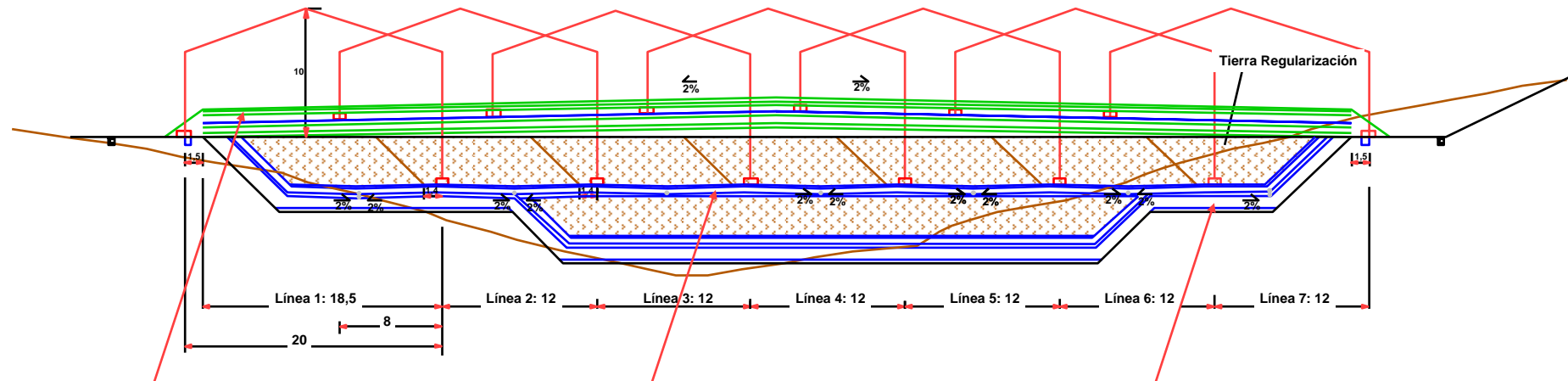
VLLW disposal development

BARRIERS

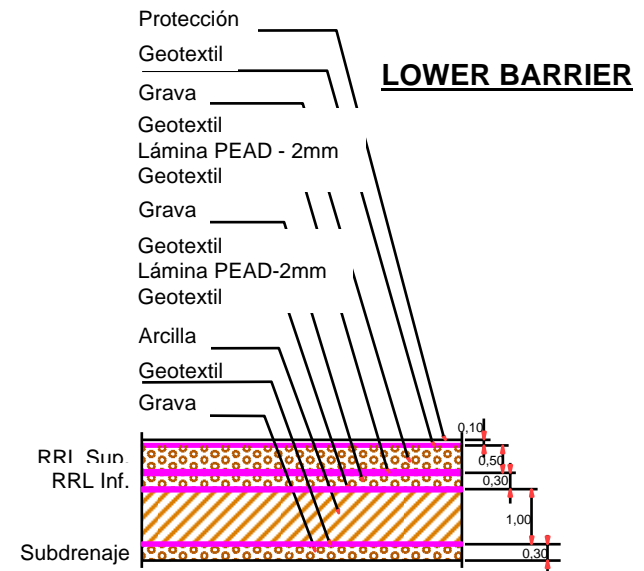
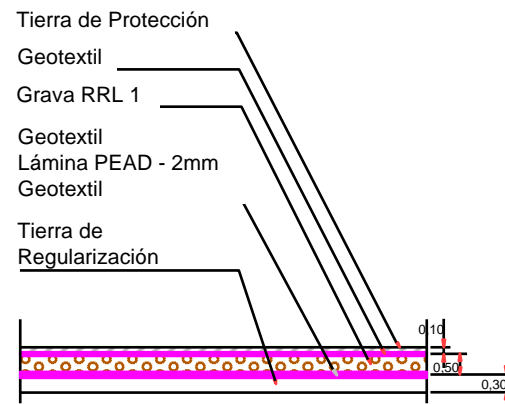
DISPOSAL PROCESS



VLLW disposal: Cross-section



INTERMEDIATE PROTECTION



El Cabril: VLLW disposal area construction works



CONCLUSIONS

- **Complete system for LLW management working in operation**
- **VLLW new disposal facility together with volume reduction efforts will provide room for the entire nuclear programme**
- **Continuous improvement in safety assessment and knowledge of the barriers' behaviour required**