SNF Back End - Spain

Fco. Javier Fernández López
Head HLW Eng. and R&D Dpt.

IAEA – Integrated Approaches for the Back End of FC

Vienna, July, 2018
- 10 NPPs: 7 in operation at 5 sites
  - 7,3 GWe
  - 20 % Electrical Energy Generation
- 1 NPP shutdown. Preparing pool emptying
- 2 NPPs in D&D
- El Cabril : Disposal for VLLW/ILLW
- Villar de Cañas: Temporary storage for SNF/HLW in development
The Spanish Government is responsible for establishing the Policy on Radioactive Waste Management and Radioactive and Nuclear Installations D&D

- Revision: Every 4 y or per MINETUR request
- ENRESA elaborates and sends it to MINETUR
- Submitted to Public Information

Published at www.enresa.es (in Spanish and English)
SNF AND HLW MANAGEMENT POLICY – 6th GRWP

• Different options assessed according to Spanish Nuclear Program Size
  • Open Cycle currently considered.
  • Deep Geological Disposal preferred (needed in any case: closed or open cycle)
    • Needs ample societal and technical development
    • Interim storage in the meantime
      • It allows R&D to provide solutions to future decisions: confirming SNF direct disposal or even coming back to recycling if advanced cycles are industrially deployed.
      • Centralized solution preferred with ad-hoc facilities when needed

• Conclusions:
  • The priority is the Centralized Interim Storage Facility (ATC)
  • Deep Geological Disposal studies continuation. Considered as an assumption for financing the Waste Fund.
  • Costs supported by the NPPs as a fee on nuclear electricity gross production
## SNF and HLW-SW Inventories

<table>
<thead>
<tr>
<th>Type</th>
<th>Storage</th>
<th>Current Inventory (^{(1,2)}) FA</th>
<th>Total Estimates (^{(3)}) FA (tU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNF (UO(_2))</td>
<td>PWR</td>
<td>Wet</td>
<td>7108</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dry</td>
<td>1465</td>
</tr>
<tr>
<td></td>
<td>BWR</td>
<td>Wet</td>
<td>6989</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dry</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>15562</strong></td>
</tr>
</tbody>
</table>

1. As of December 31\(^{st}\), 2017.
2. Burnup up to 60 GWD/tU
3. For 40 y of operation

<table>
<thead>
<tr>
<th>Type</th>
<th>Type</th>
<th>Total Amount (m(^3))</th>
</tr>
</thead>
<tbody>
<tr>
<td>HLW</td>
<td>Canister CSD-V</td>
<td>68 (12)</td>
</tr>
<tr>
<td>ILW-LL (Special Waste)(^{(5)})</td>
<td>Canister CSD-B</td>
<td>12 (2,14)</td>
</tr>
<tr>
<td></td>
<td>Canister CSD-C</td>
<td>12 (2,22)</td>
</tr>
<tr>
<td></td>
<td>Waste from reactor dismantling(^{(4)})</td>
<td>~530 – 600 m(^3)</td>
</tr>
</tbody>
</table>

4. Package type in definition.
5. GTCC waste in USA terminology
Management Strategy for SNF and HLW/SW

MAIN HISTORICAL OBJECTIVES:

• TO PROVIDE ENOUGH CAPACITY TO ALLOW THE OPERATION OF NPPS WHILE LOOKING FOR A SOLUTION FOR LONG TERM INTERIM STORAGE
• TO LOOK FOR LONG-TERM DISPOSAL SOLUTIONS

1.- Reracking 90´s

2.- ISFSI 2000-2016

3.- ATC 2018-2077

4.- DGR 2068-
All reactor SF pools where re-racked to compact racks in the 1990’s
SNF Back End Spain

Dry Storage at Reactor Sites (In Operation)

Trillo

- DPT dual purpose cask (21FA)
- Relicensed up to 49 GWd/tU
- Capacity: 80 casks
- Commissioned in 2002
- 32 casks (672 FA)
- New cask ENUN32P

José Cabrera

- HI-STORM 100 / HI-STAR (canister-based system)
- Licensed for transport up to 45 GWd/tU
- Capacity: 16 casks (4 for SW)
- Commissioned: 2009
- 12 casks with 377 FA

Ascó

- HI-STORM 100 / HI-STAR (canister-based system)
- Licensed for transport up to 45 GWd/tU - for storage up to 55 GWd/tU
- Capacity: 32 casks
- Commissioned: 2013
- 17 casks with 544 FA (2 casks expected in Autumn 2018)
Sta. Mª de GAROÑA

- ENUN52B (dual purpose cask)
- Licensed for limited contents (burnup, cooling times)
- Capacity: 32 casks
- Being assessed for emptying the pool prior to D&D

ALMARAZ

- ENUN32P (dual purpose cask)
- Cask licensed for storage up to 65 GWd/tU and for transport up to 45 GWd/tU
- Capacity: 20 casks up to 55 GWd/tU
- 1st loading expected in 2018
COFRENTES NPP

- HI-STAR 150 (dual purpose cask)
- License for S&T expected to begin evaluation in 2018
- Expected to become operational in 2021
- ISFSI: Request for construction & EIA done
  - 24 positions on a pad outdoors
ATC. The Centralized SNF and HLW Storage Facility Project

- Defined as a priority in the 6th General radioactive Waste Plan

- **Parliament supported:**
  - In 2004, the Industry Commission of the Parliament unanimously asked the Government to develop an ATC facility
  - In 2006, the Parliament urged the Government to set up an Inter-Ministerial Commission to lead the site selection process

- **Site selection**
  - Launched in December 2009 with a decree establishing the minimum criteria and how to proceed.
  - Technical report released in September 2010 pre-characterizing the eight (8) final candidates’ sites and providing proposal a candidate sites to the Cabinet
  - In December 2011 site selection is approved by Cabinet Minister (Villar de Cañas, Cuenca)

- **Project Development**
  - Positive report on the site characterization report by CSN (Needed for EIS and Site Permit).
  - PSAR being reviewed by CSN to get Construction Permit (Rev. 2 sent in June solving all pending RAIs).
  - Blocked by proposed new regional environmental regulation, pending Courts sentence.
SNF BACK END SPAIN

MAIN PROCESS CONCEPTUAL DESIGN

[Diagram showing the main process conceptual design of SNF back end in Spain, including reception, treatment, storage vaults, and various components like fuel canisters, storage tubes for vitrified wastes, and encapsulating cell.]
Deep Geological Disposal. Previous works

• Site identification Program: 1986-1996
  • Stepwise Screening
  • To a phase where drilling boreholes became necessary

• Deep Geological Repository design and associated Performance assessment (1990-2004) in three steps:
  • Disposal concept and basic design
    • Carbon steel canisters placed horizontally in parallel galleries, with Calcium-Bentonite seal
  • Strengthening the bases of the concept
  • Optimization through requirements review

• 2 Basic Design + Performance Assessment performed (granite and clay)

• R&D projects, including experimental work in foreign underground laboratories.
DGD stages as proposed in the 7th General radioactive Waste Plan (Draft):

1. 2014-2020  Report to the Government on knowledge actualization
2. 2020-2023  Report assessment
3. 2023-2027  Site designation process
4. 2028-2035  Analysis of candidate sites and site selection
5. 2036-2050  Site characterization and validation
6. 2051-2063  Licensing and Construction
7. 2063-2068  Initial Operation
8. 2069-  Normal Operation
Summary and conclusions

• The priority is the Centralized Interim Storage Facility (ATC)
  • Site selected December 2011
  • Casks Storage Building to be commissioned earlier than Main Process, around 2022
  • Main Installation Scheduled for 2024 (There is a regional environmental regulation that is being litigated in the Courts)

• Complemented by “in situ” Increased Storage capacity when required
  • ISFSI
  • Preparation for pool unloading and transport to ATC

• Deep Geological Disposal studies continuation to support decision making about management options
  • Direct disposal considered as the basic assumption

• R&D plan
  • Support to SF/HLW acceptance and characterization: performance oriented; Long term storage. Ageing management
  • DGR development
Challenges

- TECDOC-1774
  - Spain’s CSN addressed joint Storage and Transport requirements, as a consequence of Spanish strategy of implementing a Centralized Facility

- Other points for discussion:
  - Variety of systems for interim storage / transportation
  - Continuous evolution of storage & transport regulations
  - Disposal postponed: good to gain time for decision making
    → Future disposal requirements?
  - Waste Acceptance Criteria for S&T (and associated characterization)
    → Also suitable for disposal?
  - Delays in political decisions and project development
El Gobierno paraliza el permiso de construcción del almacén de residuos nucleares

El ministerio insta al CSN a que suspenda la tramitación del expediente del silo de Cuenca

Madrid - 18 JUL 2018 - 08:26 CEST

El Ministerio para la Transición Ecológica ha decidido paralizar el permiso de construcción del almacén para residuos nucleares, ideado hace casi dos décadas y que acumula un enorme retraso. El Almacén Temporal Centralizado (ATC), previsto por el Gobierno del PP en Villar de Cañas (Cuenca) para guardar los residuos de todas las nucleares, cuenta con el rechazo del Ejecutivo socialista de Castilla-La Mancha. El ministerio ha enviado un escrito al Consejo de Seguridad Nuclear (CSN) para que suspenda la tramitación del permiso de construcción. Quiere tener diseñada su política energética antes de que se dé vía libre a este polémico proyecto.
Thank you for your attention!