
IAEA Headquarters.
Vienna, Austria.

Licensing a Centralized Spent Fuel Storage Facility

ENRESA
(National Enterprise for Radioactive Waste)

Mr. Miguel A. Martinez HLW Engineering Department

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NPPs LOCATION AND SF SITUATION

- 10 Nuclear Reactors
- 7 reactors in operation at 5 sites
  - 7.400 MW
  - 21% of country’s electricity generation (2012)
- 2 NPP shut down under decommissioning
- 1 NPP stopped
1. Reracking 90’s

2. ISFSI 2000-2016

3. ATC 2017-2077

4. DGP 2068-

- PROVIDING ENOUGH CAPACITY TO ASSIST THE OPERATION OF NPPS WHILE LOOKING FOR A FOR LONG TERM INTERIM STORAGE SOLUTION.

- PLANNING FOR LONG-TERM DISPOSAL SOLUTIONS
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General aspects of SNF management

- **Different options presented and assessed according Spanish Nuclear Program Size**
  - Deep Geological Disposal preferred
    - *Needs extended public acceptance and technical development*
    - *Interim storage in the meantime*
      - It allows R&D to provide solutions to future decisions: confirming geological 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)
  - Complemented by In situ Increased Storage capacity when required
  - Deep Geological Disposal studies continuation to support decision making about management options. Considered as an assumption for financing the Waste Fund.
  - R&D Plan 2009-2013. Following one is being prepared.
  - Costs supported by the NPPs as a fee on nuclear electricity gross production
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(CENTRALIZED STORAGE FACILITY FOR SF) ATC. MAIN ADVANTAGES OF ATC OPTION

ATC

(CENTRALIZED STORAGE FACILITY FOR SF AND HLW)

- Enables SF and HLW common management
  Interim management becomes independent of (disposal)
- Provides extra capacity to deal with potential unexpected events
- Reduces the amounts of management facilities thus decreasing the risks and obligations
- Allows the declassification of nuclear grounds after NPPs decommissioning
- Allows to comply with existing obligations of bringing back waste from foreign reprocessing
- Significantly saves costs
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SELECTED TECHNOLOGY: VAULTS AND CONCRETE BUILDING

Vaults for spent fuel and high level waste (vitrified) and a Concrete building for medium long-lived waste

Selected criteria:

- **Safety:**
  - Multiple barrier confinement
  - Passive safety features
  - Cooling by natural flow
  - Low doses

- **Economy:**
  - Compact and modular
  - Low operating costs

- **Strategy:**
  - Independence between management stages
  - Long life design
  - Reversibility
  - Flexibility

- Internationally proven technology
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**THE FULL EXTENT OF ATC FACILITIES**

- **ATC AND ANCILLARIES**
  - Main facility: Storage vaults, reception and process areas
  - ILW-GTCC Storage building, casks storage, maintenance workshop

- **ASSOCIATED RESEARCH CENTER**
  - SF and Radwaste lab (Integrated in the Nuclear Installation)
  - Conventional labs

- **BUSINESS PARK**
  - Enterprises center
  - Industrial area
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SELECTED TECHNOLOGY: VAULTS AND CONCRETE BUILDING

Contains:

- **Vaults** for spent fuel and high level waste (vitrified) and a **concrete building** for medium long-lived waste

Selected technology criteria:

- **Design:**
  - Multiple barrier confinement
  - Cooling by natural draft
  - Low dose

- **Economy:**
  - Compact and modular
  - Low operating costs

- **Strategy:**
  - Independence among management stages
  - Long life design
  - Reversibility
  - Flexibility

- **International benchmark of technology**
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CONCEPTUAL DESIGN

http://www.enresa.es/publicaciones_y_audiovisuales/videos_e_interactivos/interactivo_atc
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PROPOSED LAYOUT
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SECTION

CELDA DE DESCARGA CONTENEDOR DE MANEJO ZONA DE PREPARACIÓN DE CONTENEDORES

LEVEL +17.000
LEVEL +23.500
LEVEL +22.700
LEVEL +25.800
LEVEL +45.500
LEVEL +8.500
LEVEL +0.000
LEVEL -6.500
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LIFE MANAGEMENT PLAN

Fuel

HEAT INSULATING THICKNESS: 50mm

SHIELDING PLUG Ø ext. 1030 x 10 mm
Ø ext. 960 x 10 mm

(WELL) Ø ext. 1030 x 4 mm (Air double jacket)

CANISTERS (See detail)

4 GUIDES

INTERMEDIATE FLOOR (3 clearance)

SHOCK ABSORBER Ø ext. 810 x 4 mm

LOWER GUIDE PLATE FOR HORIZONTALITY ADJUSTMENT

ANCHORS (Out of scope)

SITE WELD AFTER x, y POSITIONNING

Metallic components

3 Axes

Concrete
Main Facility Postulated Accidents:

- **Transport Cask Accidents**
  - Vehicle Collision
  - Cask Tip over

- **Handling:**
  - Spent Fuel Element Drop.
  - HLW/MLW cask fall (applicable also for the CMF).
  - Loss of Process Building HVAC.

- **Storage:**
  - SF Canister & HLW Canister Drop.
  - Partial obstruction of convective air flow on vaults/ Chimney loss.
  - Loss of Process Building HVAC.

- **Other:**
  - Shielding Function Failure.
  - Confinement Barrier Failure.
  - SSC Structural Failures
  - Internal Fire

- **External:**
  - Long term loss of external power supply.
  - Earthquake
  - Internal Flooding
  - Tornados & Lightning.
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ATC RECEPTION BUILDING
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ATC PROCESS BUILDING
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ATC STORAGE BUILDING (VAULTS) PHASE 1
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VAULTS AND TUBES DETAILS

PWR 17 x 17
Cavity section 227.5 x 227.5
7 places (only 6 Fuels)

PWR 17x17

Ø975
24

GAP=3

Ø911

Ø905

Ø927

THK=8

WELL OD1015
ID 995 (NOTE 1)

JACKET OD1065
ID 1077 (NOTE 1)
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STORAGE VAULTS HEAT REMOVAL PRINCIPLE
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CASK INTERIM STORAGE FACILITY

- **CASK BUFFERING:**
  - Immediate needs from NPPs.
  - ISFI’s liberations
  - Operational need for the ATC cell.

- Preliminary capacity for 70 casks.

- Design according to nuclear standards.
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CASK INTERIM FACILITY NEW STORAGE LICENSING CONDITIONS.

- Dual Purpose Casks are presently licensed for Storage in NPP ISFSI´s, some in buildings and some in pads.
- Dual Purpose Casks shall have to be re-licensed for storage in the ICSF storage conditions at Villar de Cañas (Earthquake, external flooding, etc., etc.).
- Thermal, shielding, criticality analysis must be performed with the most unfavourable combination of casks.
- Cask interim Facility should be operable before the main facility, to accommodate particular needs of the different ISFSI´s.

Cask Interim Facility Layout
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CASK MAINTENANCE FACILITY

LIGHT MAINTENANCE POSITIONS

DECONTAMINATION CELL

INTERNAL MAINTENACE POSITION
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CASK MAINTENANCE FACILITY (CMF)

- Maintenance Types:
  - "Light": Only external maintenance
    - 20 ÷ 80 operations / year
  - "Heavy": Internal decontamination in hot cell, internal & external maintenance
    - 15 operations / year
    - Up to 3 casks simultaneously.
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CASK MAINTENANCE FACILITY (CMF) DECONTAMINATION & INTERNAL MAINTENANCE
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CASK MAINTENANCE FACILITY (CMF) INTERNAL MAINTENANCE
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CASK MAINTENANCE FACILITY (CMF) EXTERNAL MAINTENANCE & SHIPMENT
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PROJECT STATUS

• Generic Design of a vault-type facility in 2003
• Approved with conditions by the CSN (Spanish Safety Authority) in 2006
• Complementary preliminary projects developed between 2006 and 2010:
  • Loaded Cask Facility
  • Spent Fuel and Radioactive Waste Laboratory
  • Cask Maintenance Facility
• Preliminary Characterization of the three areas offered by the Municipality
• 1st Phase of the detailed study of the site finally purchased
• Awarding Process & Selection of the Engineering Companies
• Preliminary Safety Assessment Report (PSAR) + Environmental Impact Assessment (EIA):
  ➢ Previous and Construction Permits
• Detailed Design
• Industrial classification of the site
• Ongoing information to local stakeholders

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