

Spanish strategy for the management of Spent Nuclear Fuel – ATC Project

IAEA, Vienna, June 2015



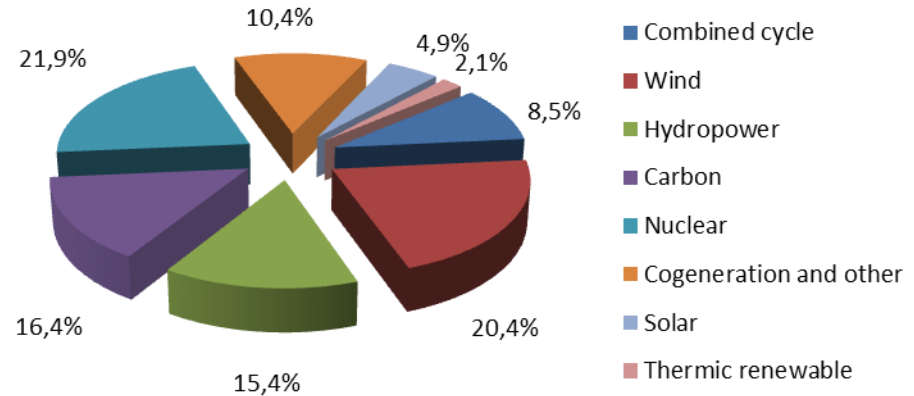
- Nuclear Energy in Spain Overview
- SNF& HLW Management Policy
- Interim Storage at Reactor Sites
- Centralized Interim Storage – ATC Project
- Challenges and Discussion
- Conclusions



10 Nuclear Power Reactors:

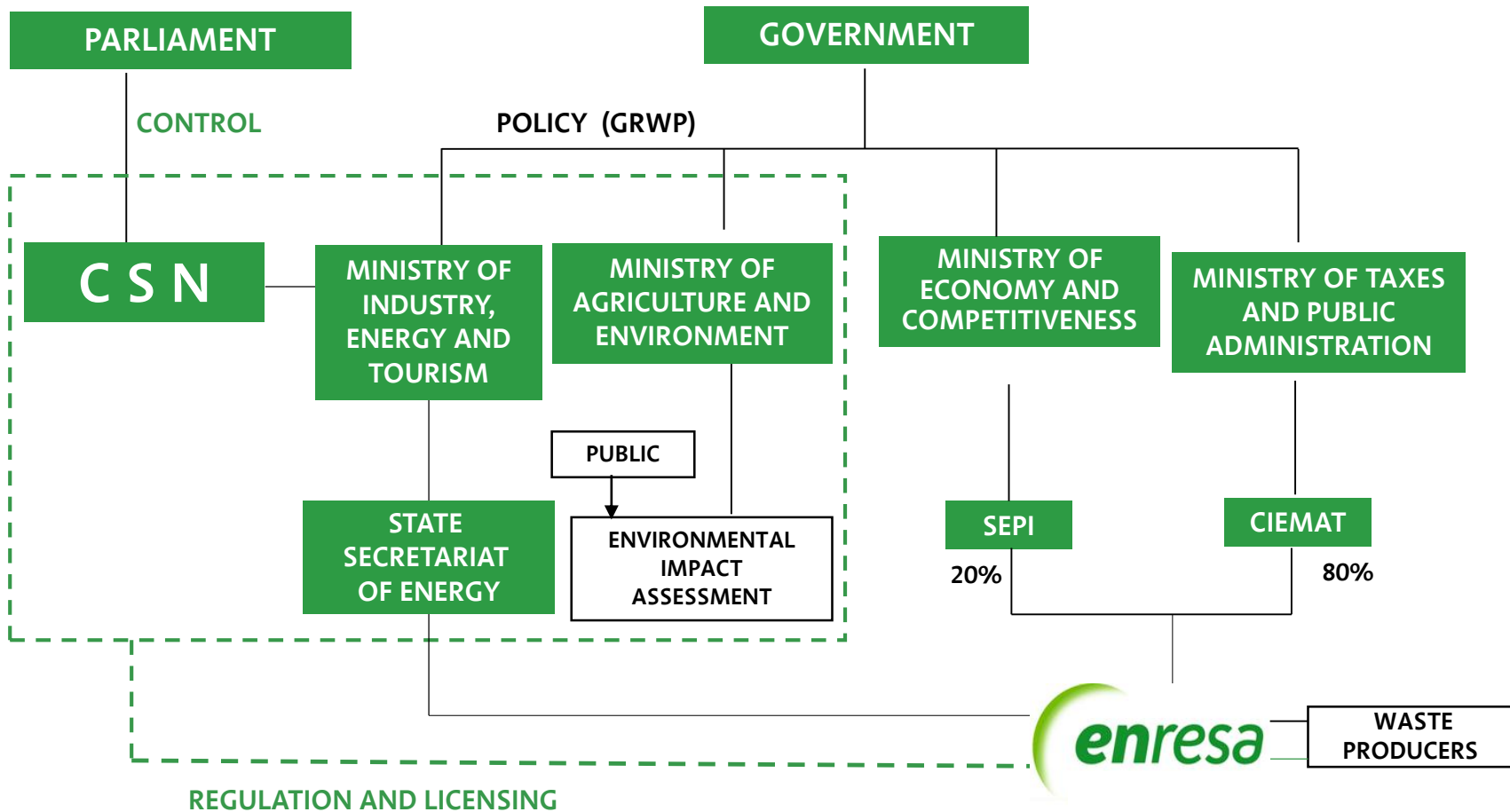
- 7 in operation in 5 sites
- 1 shutdown in standby
- 1 in D&D
- 1 dismantled (latency period)

Energy demand coverage 2014



Nuclear Energy:

- 7,7% of installed power (7.39 GWe) in 2014
- 21,9% of energy production in 2014





	Type	Storage	Current Inventory ^(1,2) FA (tU)	Total Estimates ⁽³⁾ FA (tU)
SNF (UO ₂)	PWR	Wet	6696 (3075)	11395 (5136)
		Dry	1125 (450)	
	BWR	Wet	6485 (1163)	8389 (1504)
		Dry	--	
			TOTAL	14306 (4688)

(1) As of 31 December 2014.

(2) Burnup up to 60 GW/tU

(3) For 40 y of operation

	Type	Total Amount (m ³)
HLW	Canister CSD-V	68 (12)
ILW-LL (Special Waste)⁽⁵⁾	Canister CSD-B	12 (2,14)
	Canister CSD-C	12 (2,22)
	Waste from reactor dismantling ⁽⁴⁾	~430 m ³



(4) Package type in definition.

(5) GTCC waste in USA terminology

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
- Information
Published at www.enresa.es (in Spanish and English)

Cabinet of Ministries approval

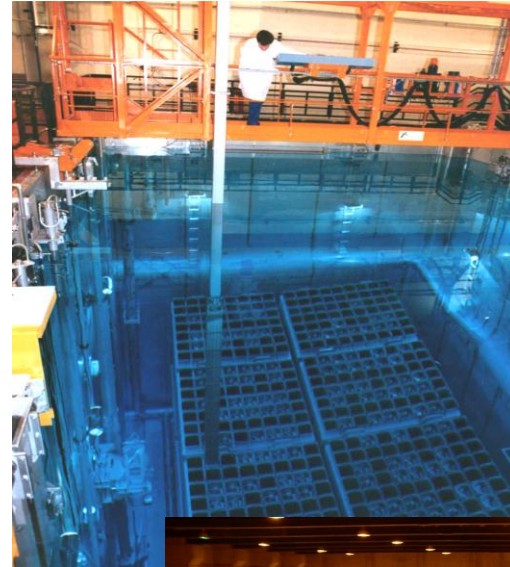


SNF AND HLW MANAGEMENT POLICY – 6th GRWP

- Different options assessed according Spanish Nuclear Program Size
 - Deep Geological Disposal preferred
 - Needs ample societal 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. 2014-2018 Plan already in force.
 - Costs supported by the NPPs as a fee on nuclear electricity gross production

Through agreements with NPPs owners:

- Pools
 - *Reracking performed in all NPPs*
- Dry systems
 - **ENRESA: Licensing and supply of transport and storage systems**
 - Through international call for bids
 - **Utilities: ISFSI licensed as a design modification of the NPP**
 - ISFSIs at Trillo, Jose Cabrera and Ascó NPPs
 - Waste Management Plan for Garoña NPP (ISFSI being built after summer 2015)
 - ENRESA is the nuclear operator of Jose Cabrera ISFSI as responsible for the D&D of the whole facility



DRY STORAGE AT REACTOR SITES (IN OPERATION)

TRILLO

JOSÉ CABRERA

ASCÓ



Dry storage at Trillo NPP

- DPT dual purpose cask (21FA)
- Relicensed up to 49 GW/tU
- Capacity: 80 casks
- Commissioned in 2002
- 28 casks (588 FA)

Dry storage at José Cabrera NPP

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

Dry storage at Ascó NPP

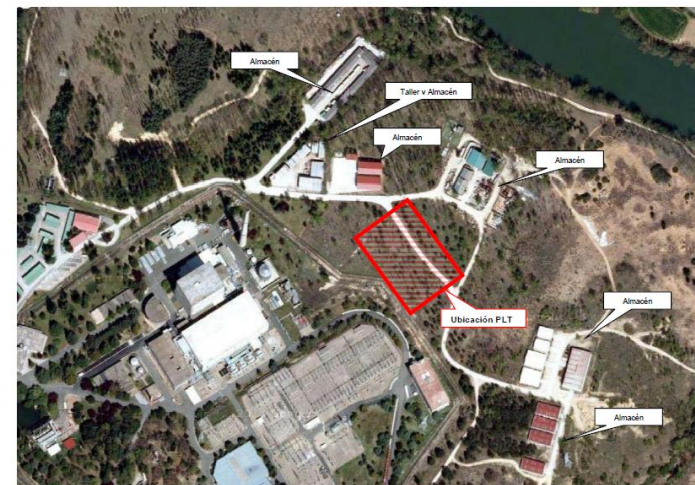
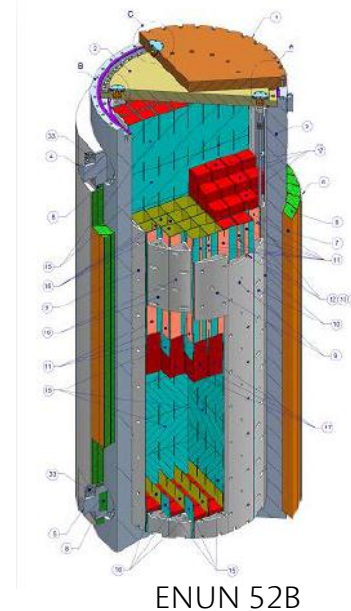
- HI-STORM 100 / HI-STAR (canister-based system)
- Licensed for transport up to 45 GW/tU - for storage up to 55 GwD/tU
- Capacity: 32 casks
- Commissioned: 2013
- 5 casks with 160 FA

DRY STORAGE AT REACTOR SITES (IN CONSTRUCTION)

NEW DRY STORAGE FACILITY

SANTA M^a DE GAROÑA NPP

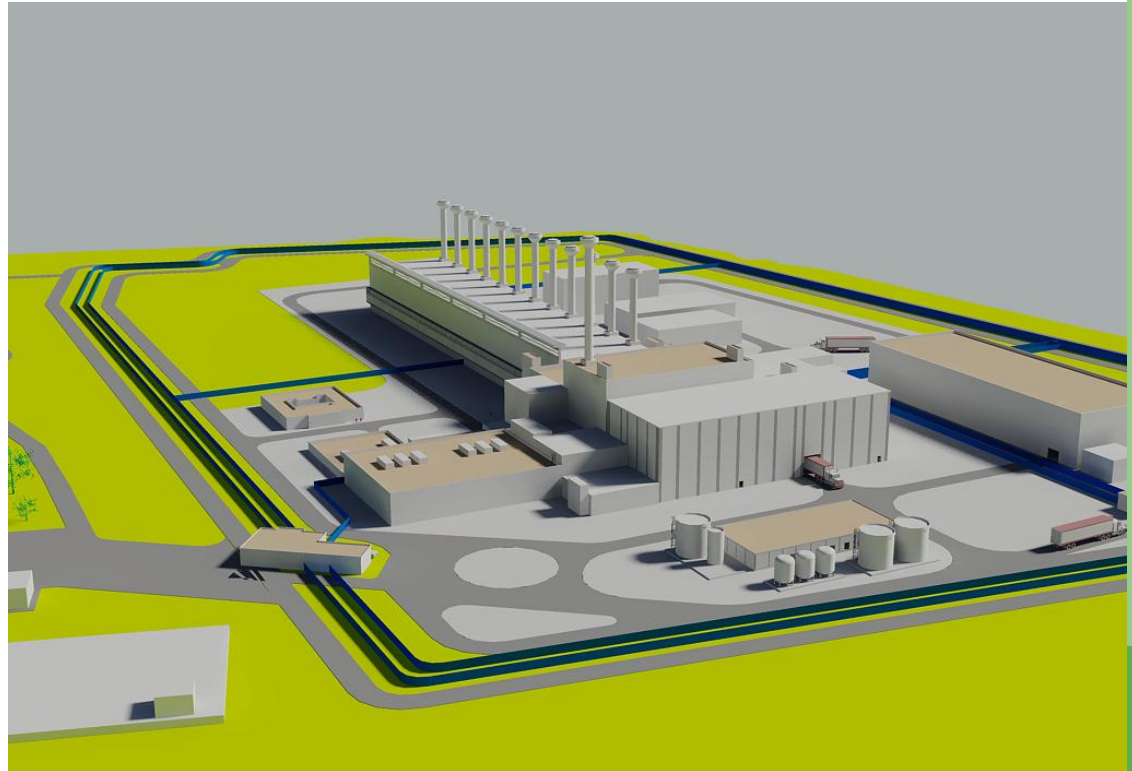
- ENSA's ENUN52B dual purpose cask
 - Design approval for storage granted in November 2014.
 - Design approval for transport granted in May 2015.
 - Limited contents (low burnup fuel, high cooling times)
- ISFSI licensed in February 2015 by the Plant owner. Construction permit expected soon.
 - 2 x 16 position pads at the open-air
 - First loading 2016. Uncertainties due to NPP situation on the restart of reactor operation.



ISFSI SITE

The Project consists of three main elements:

- The storage facility itself
- A technological research center
- A business park



Siting Process

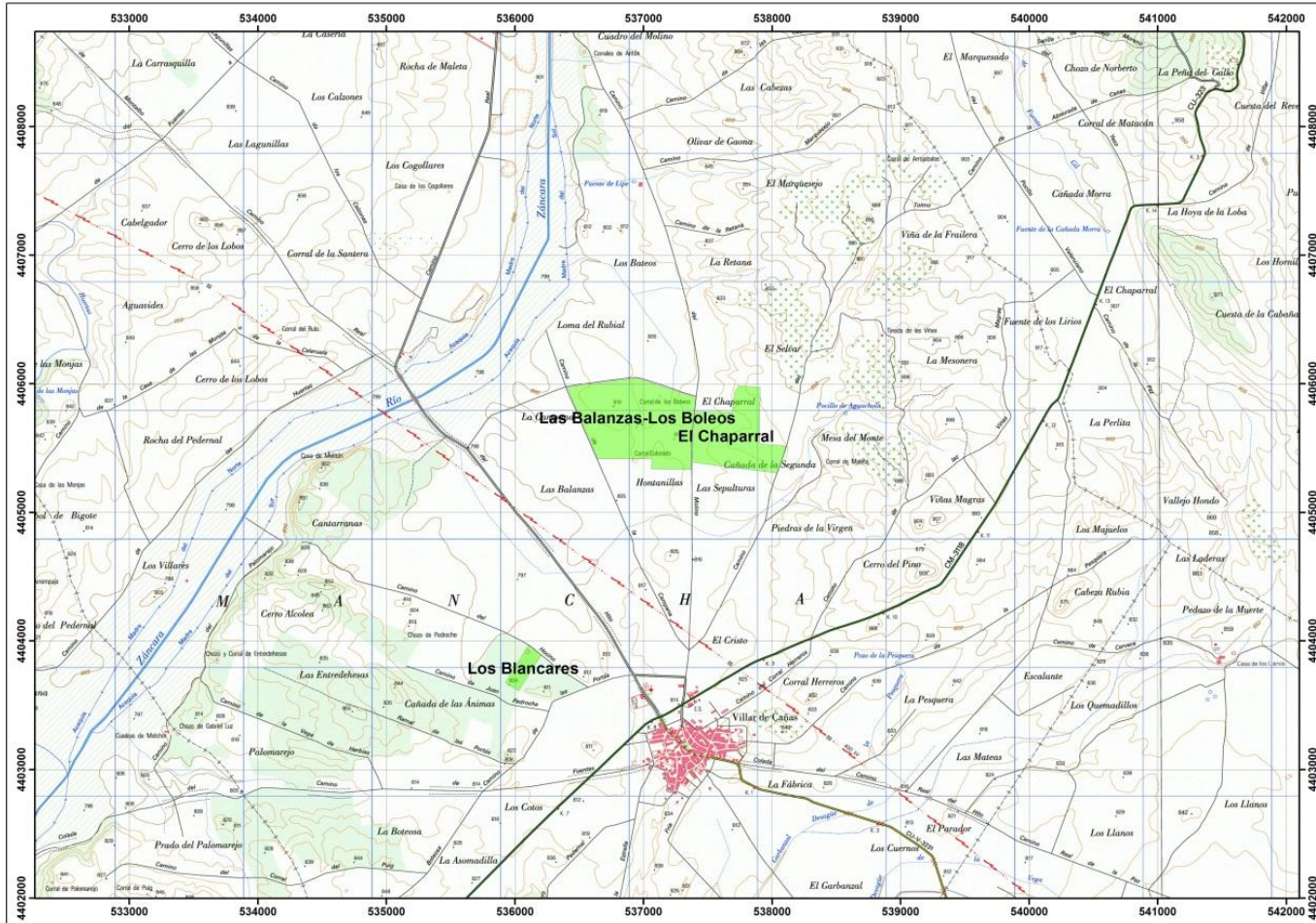
- 6th General Radioactive Waste Plan: Defined ATC as a priority
- Parliament supported:
 - In **2004**, the Industry Commission of the Parliament unanimously asked the Government to develop an ATC facility
 - In **2006**, the Parliament urged the Government to set up an Inter-Ministerial Commission to lead the site selection process
- COWAM recommendations
- 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). Confirmed in BOE – January 2012.



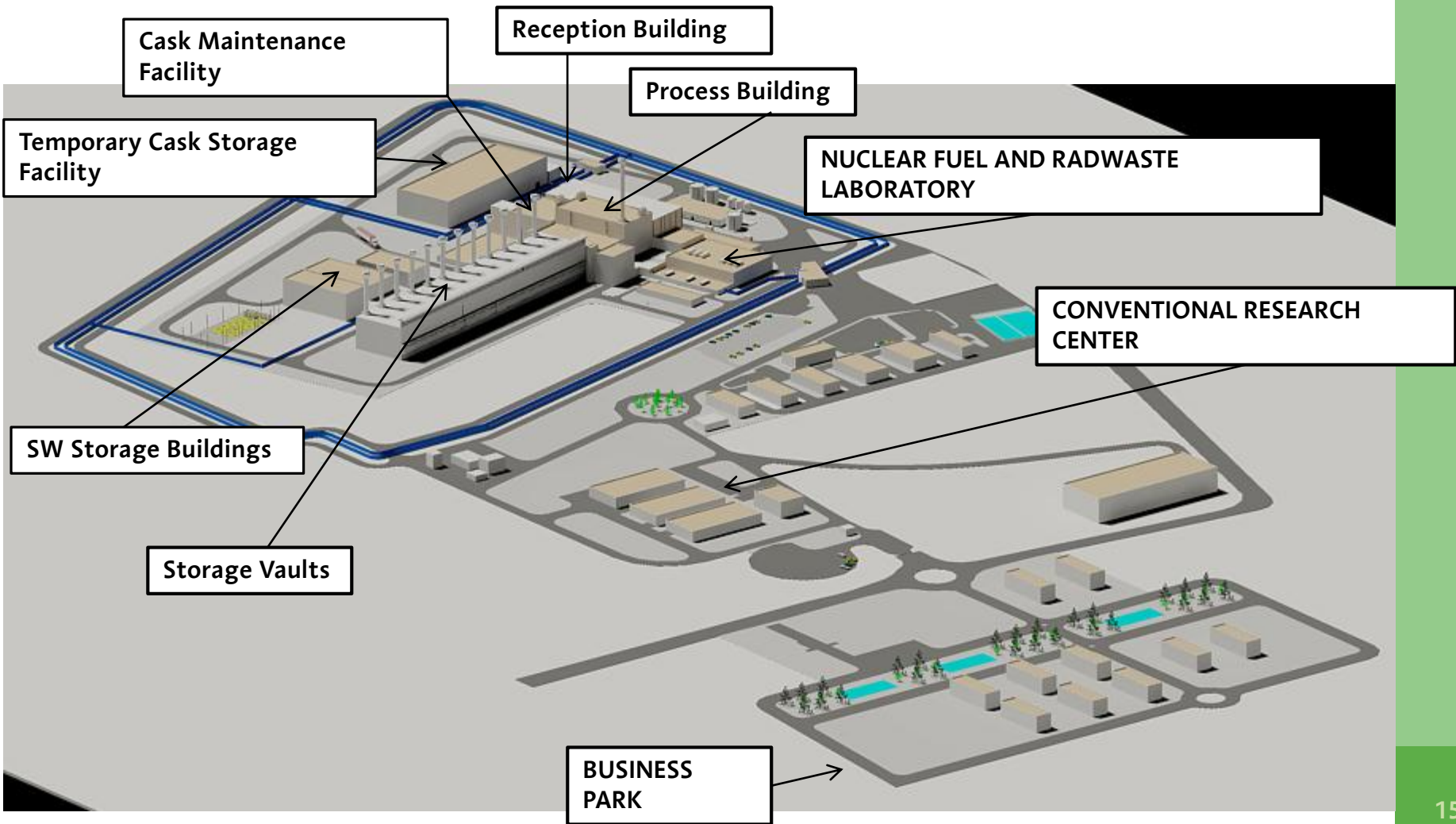
Siting Process - Candidates



Siting Process



ATC LAYOUT



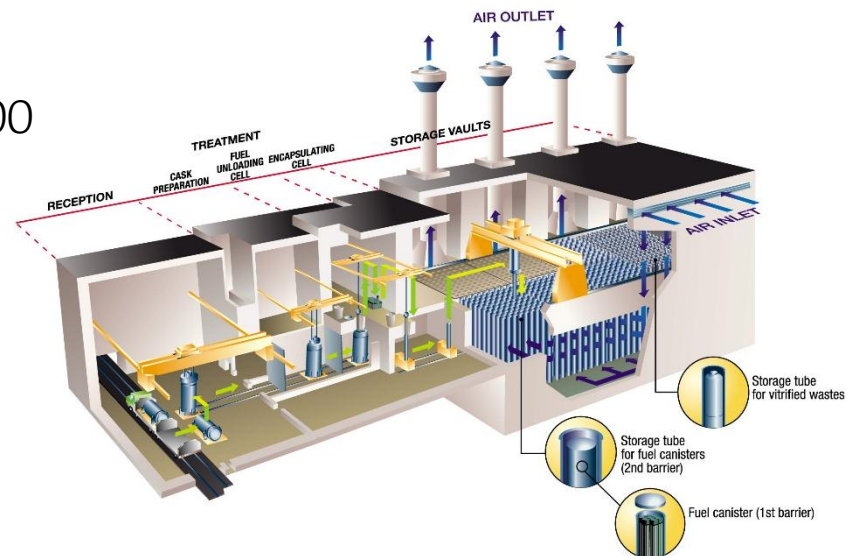
- **Characterization of the site** to provide the regulator (CSN) and the MINETUR with the documentation needed to issue the Preliminary Permit according to the RINR [7].
- Going further into the **detail design** of the facility to provide the regulator (CSN) and the MINETUR with the documentation needed to issue the Construction Permit of the facility according to the RINR [7].
 - **The Preliminary Safety Assessment Report (PSAR)** and other documents were presented in January 2014. Rev. 1 of PSAR including answers to RIAs expected in June 2015.
- **Environmental Impact Assessment** to provide the MAGRAMA with the documentation to issue the Environmental Impact Statement.
- Documentation needed to **change land use** from rural land to industrial use, according to local and regional regulation.
- Establishing a **preliminary logistics planning**.
- Providing information to stakeholders: **ENRESA Information Center** established in Villar de Cañas.

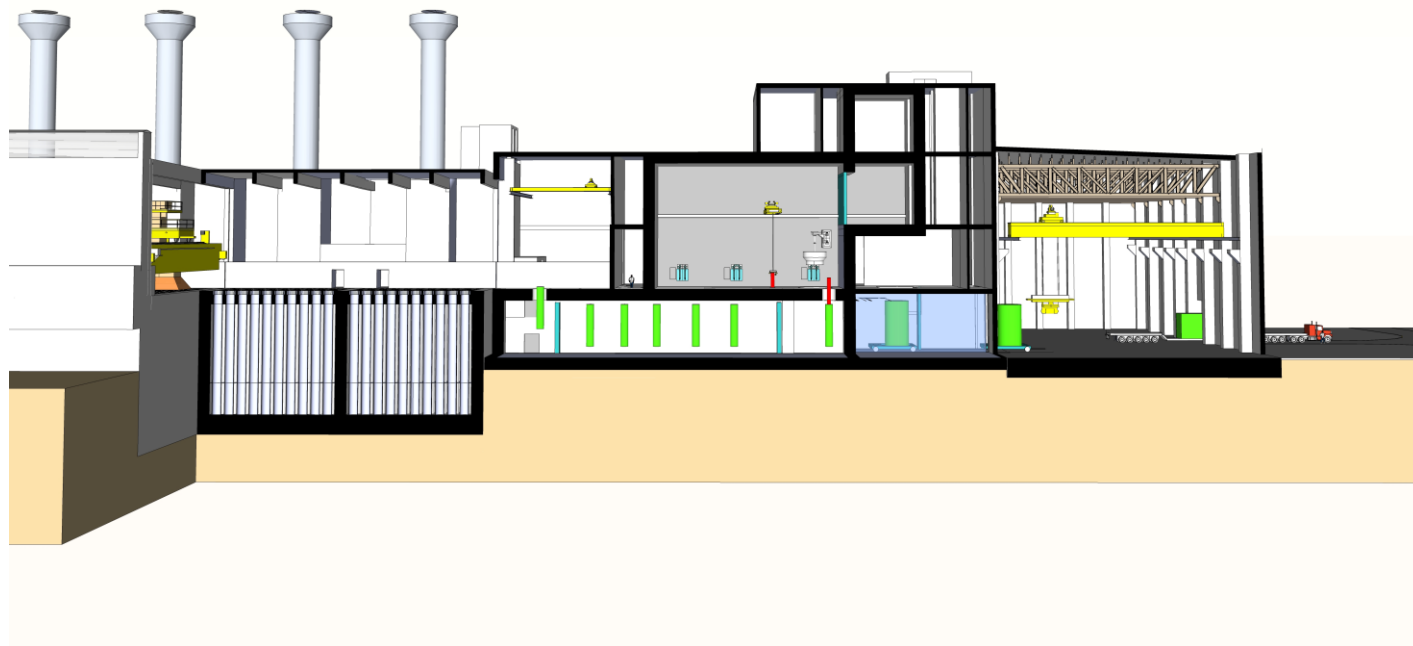
Technology:

- Dry storage of SNF and vitrified wastes in vaults
- Storage of ILW-LL waste (SW) on canisters at pits in a concrete building
- Temporary Loaded Cask Building
- Application for 60 years (design life: 100 years).

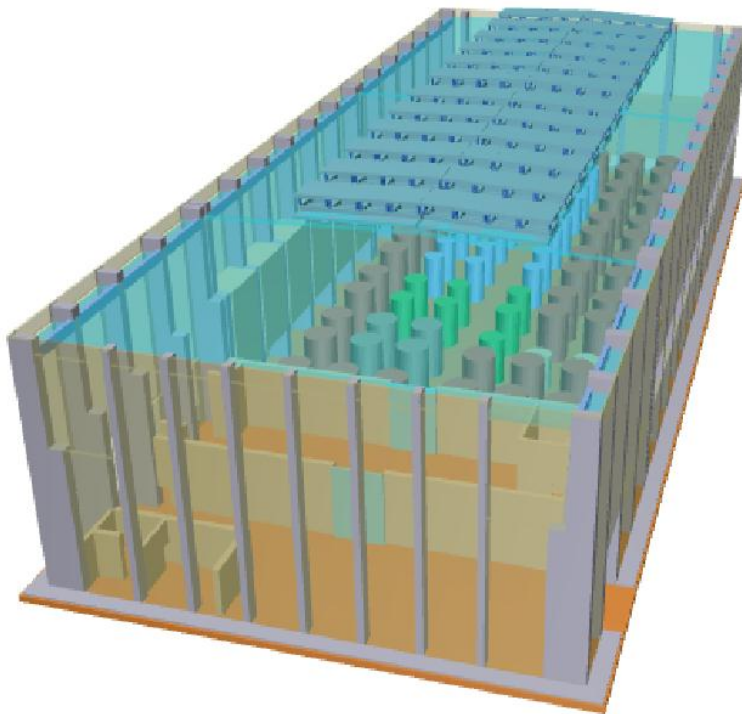
Technical regulatory framework:

- Spanish Nuclear Safety Council Instructions, Supplementary Technical Instructions, Safety Guides,...
- US NRC 10 CFR 72, NUREG-1567, SFST-ISGs, Regulatory Guides,...
- IAEA Safety Standards

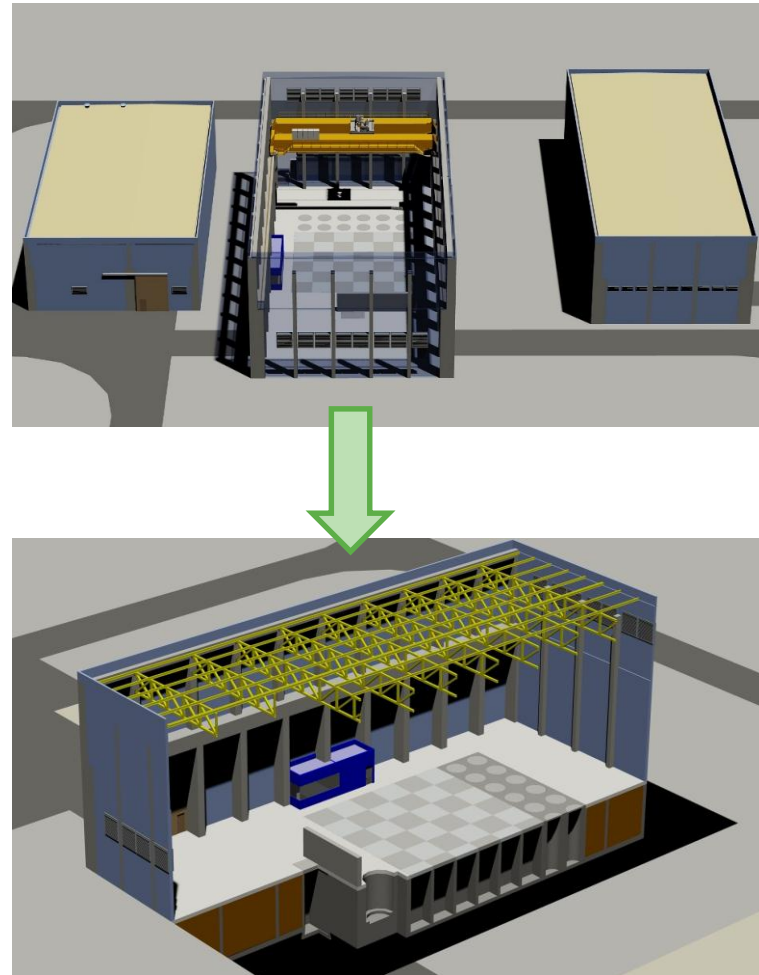




Loaded Cask building



SW Storage building





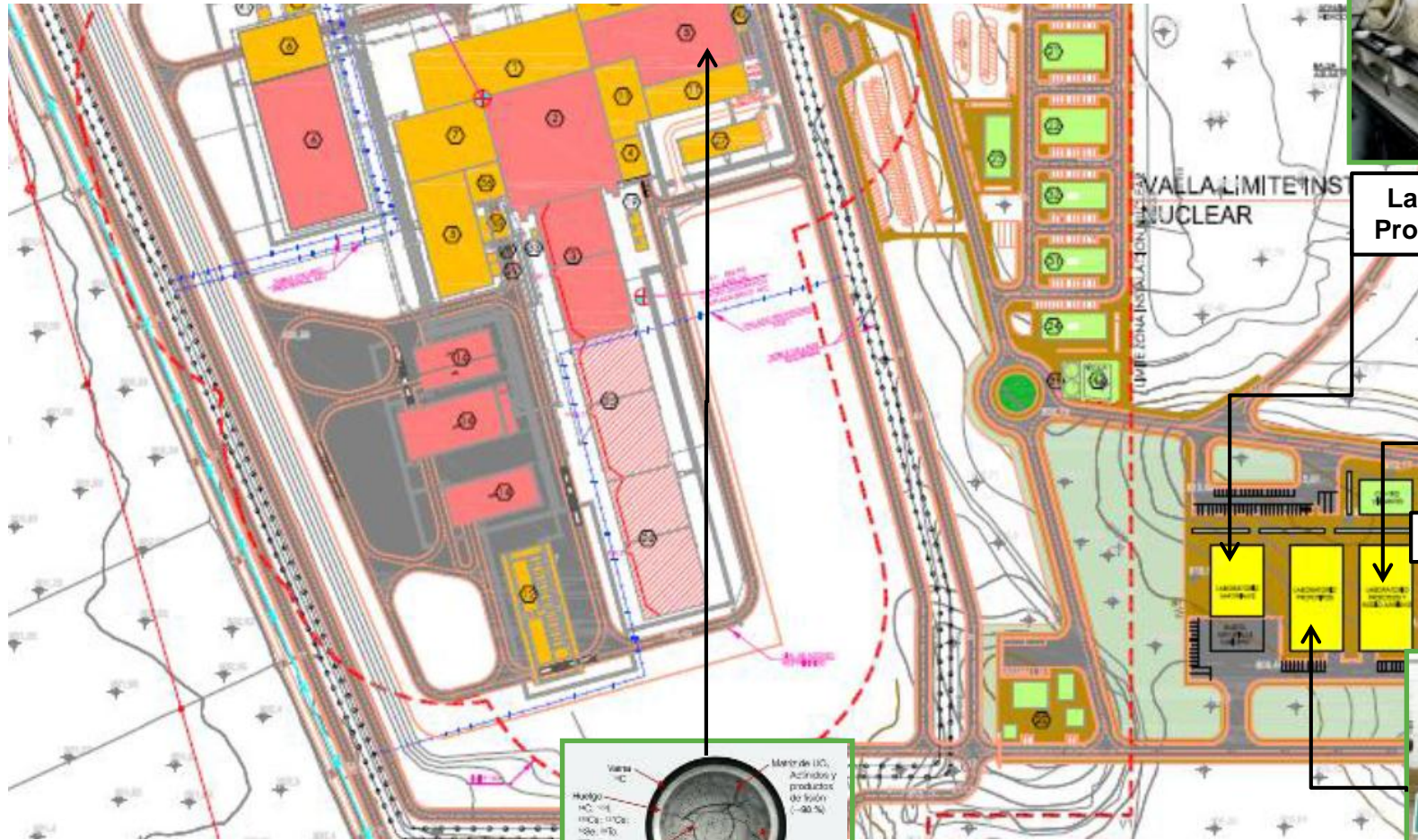
Laboratory of Industrial Prototyping and Robotics



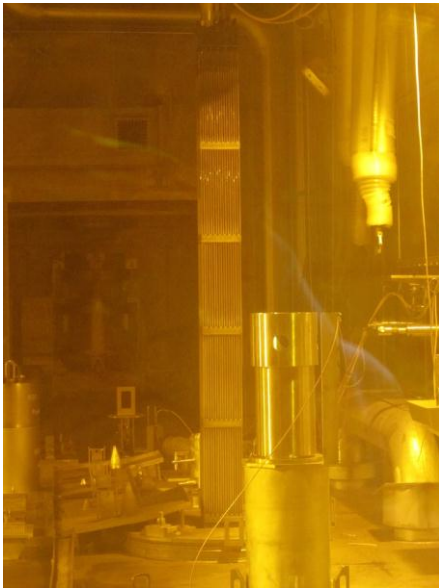
Materials Laboratory



Process Characterization and Environmental Laboratory



Fuel and Radioactive Waste Laboratory



- **Transportation:**

- Low and High Burnup Spent Fuel Transportation from the NPP to the ATC (HBU: “case by case”)

- **With NPPs:**

- Characterization and Classification of SNF (damaged/undamaged)
- Fuel Acceptance Procedures

- **ATC:**

- Very tight schedule for designing, licensing, construction, testing, and commissioning the Facility.
 - Proposed early operation of the Loaded Cask Storage Facility to provide flexibility.
- Technical issues:
 - Regulation based on NPPs + Fukushima + 9/11
 - “Zero-liquid-effluent” policy
 - Unloading cell atmosphere:
 - Failed cladding fuel
 - Fuel handling issues
 - Crud deposition
 - Remote operations – Harsh conditions

- The priority of the Spanish SNF management is the Centralized Interim Storage Facility (ATC)
 - Site selected December 2011
 - Casks Storage Building to be commissioned earlier (mid-2017) than Main Process
- Completed by In situ Increased Storage capacity when required
 - ISFSI
- Direct disposal considered as the basic assumption.
- R&D plan
 - Support to SF/HLW acceptance and characterization: performance-oriented, Long term storage, Ageing management, etc.
 - Support to decision makers on further steps of SNF & HLW Management. ATC provides time for decisions. Hot Laboratory assist R&D on SNF & HLW.

**Thank you for your attention
Questions?**