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Spent Fuel Interim Storage and Disposal in Europe – Various Experience of Westinghouse

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Decontamination, Decommissioning, Remediation and Waste Management

From Shutdown to Green Field

Spent Fuel Management

Spent Fuel Management

Westinghouse

Westinghouse manufactures most commercial nuclear fuel designs in use today

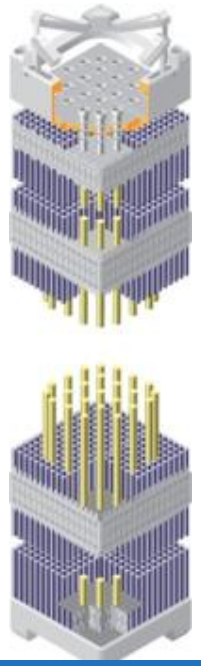
Pressurized Water Reactors (PWRs)

W-PWR

CE-PWR

KWU/Siemens PWR

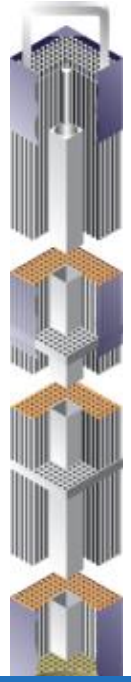
NFI PWR



Boiling Water Reactors (BWRs)

W-BWR

NFI BWR



VVER (PWR)

Advanced Gas Reactors (AGRs)

Westinghouse

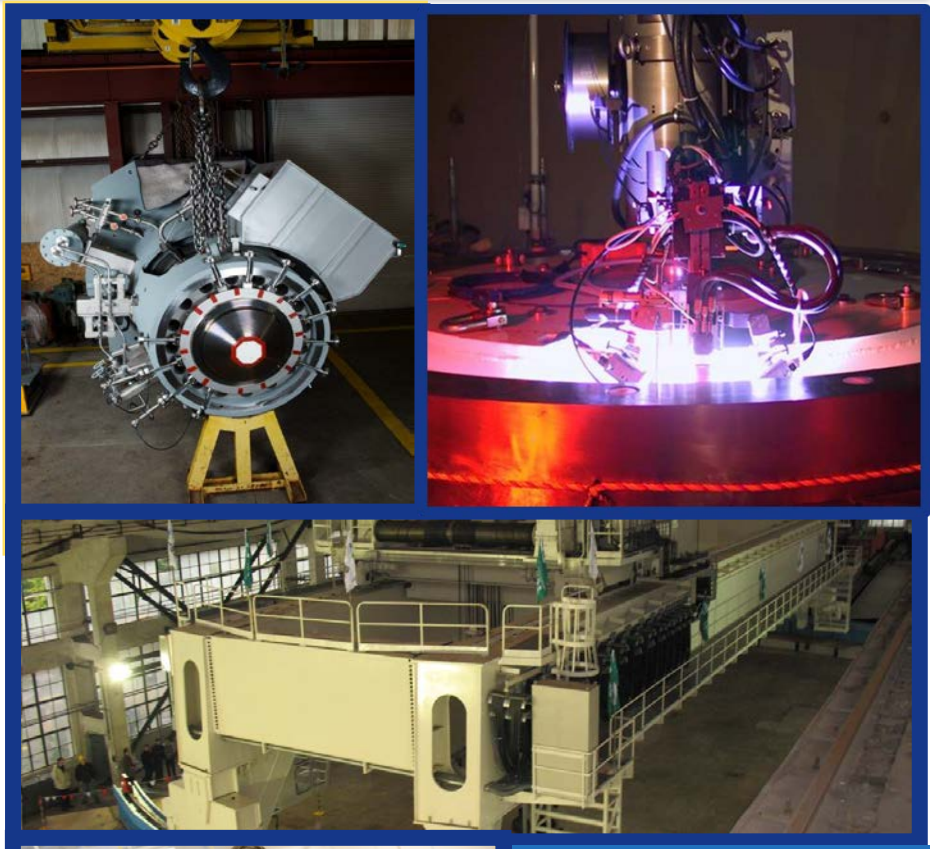
- **follows and manages fuel performance throughout its lifetime**
- **has three large fuel factories in US (Columbia), in Sweden (Västerås) and UK (Spring-fields) and a partnership in PWR with ENUSA (Spain)**

Westinghouse

Westinghouse provides fuel and fuel services spanning the nuclear fuel value chain

We supply to utilities across the globe:

- ✓ Uranium and transport
- ✓ Fuel & fuel components
- ✓ Engineering services through the Westinghouse "Engineering Center of Excellence"
- ✓ Fuel-related services
- ✓ Fuel-handling equipment and crane manufacturing
- ✓ Used fuel management services
- ✓ Used fuel storage installation design & construction
- ✓ Support for Consolidated or Interim Storage and Disposal



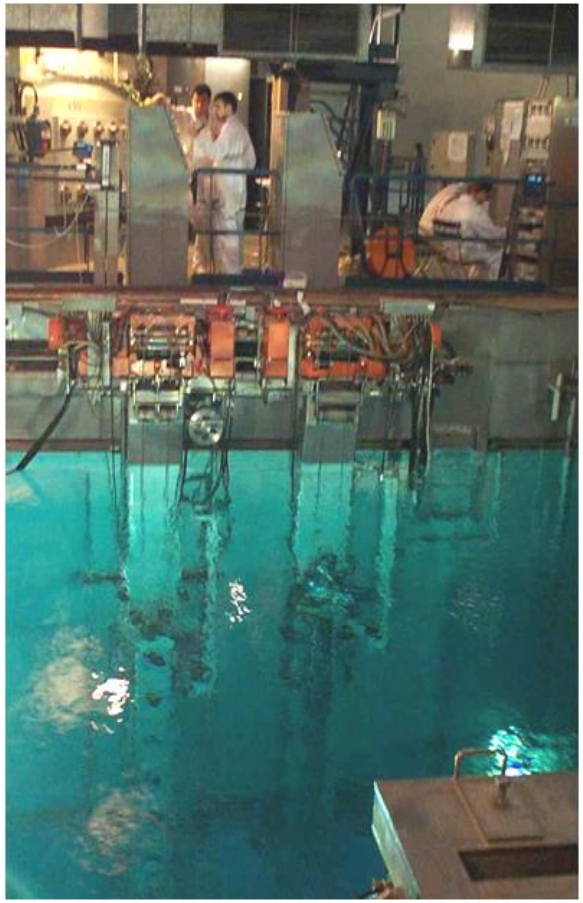
Spanning the nuclear fuel value chain

Westinghouse

Westinghouse Fuel Services in Europe

Perform services on PWR and BWR fuel from factory to final storage

- **Products**
  - Inspections and measurements
  - Failure management, Sipping and Repair
  - Tools and equipment
- **Business**
  - Nordic region 20%
  - USA 25%
  - Europe, F.E. 55%



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Transport and Storage of Defect Fuel Rods

Purpose

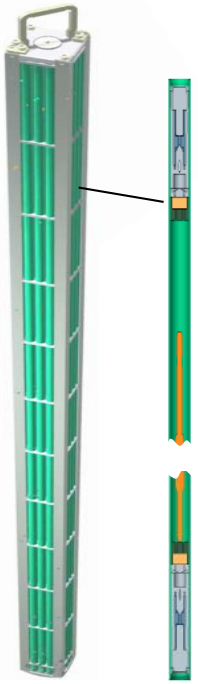
- Storage of leaking fuel rods and fuel rod fragments leak-tight in a fuel pool
- Preparation for gas-tight transport to final storage
- Preparation for final storage

Benefits

- Safe storage of leaking rods in fuel pools at nuclear power plants
- No special treatment of leaking fuel rods in final storage needed

Quiver

Dryable cask with positions for leaking fuel rods and single magazines



Single Fuel Rod (SFR) Capsulation

Dryable single rod capsule stored in magazine

Defect Fuel Rods

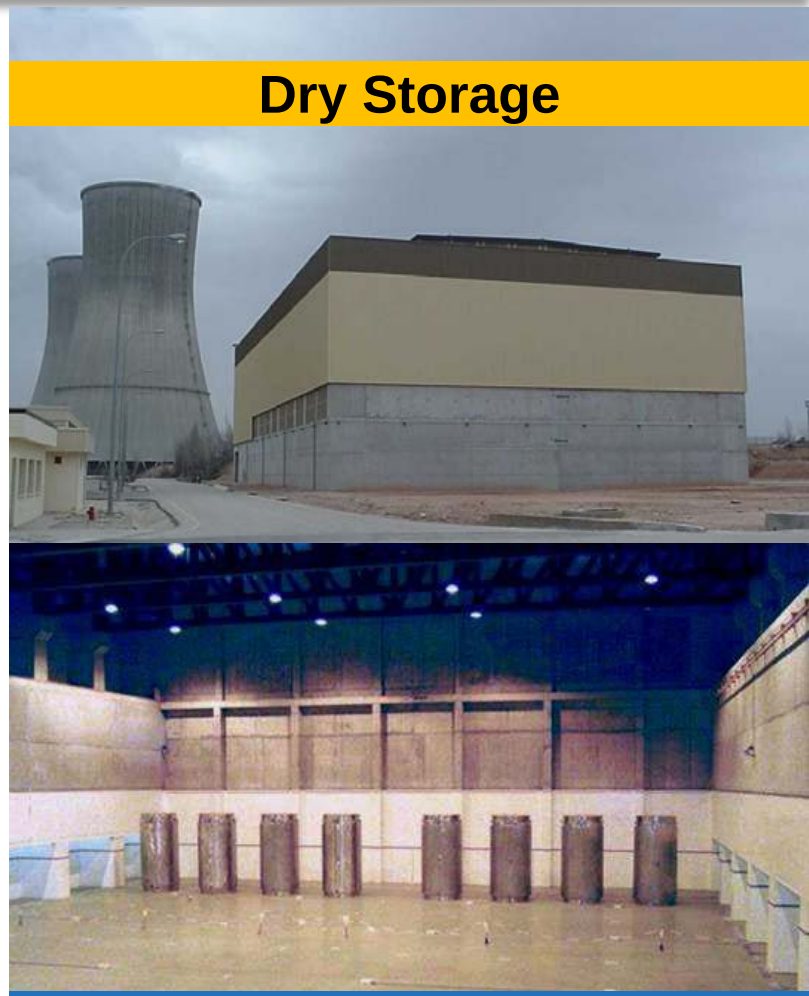
Trillo Intermediate Spent Fuel Storage Facility (Spain)

Main features

- Storage facility for 80 Spent Fuel casks
- Concrete building (with seismic & biological shield requirements)
- Natural ventilation cooling (no maintenance)
- Remote control operation

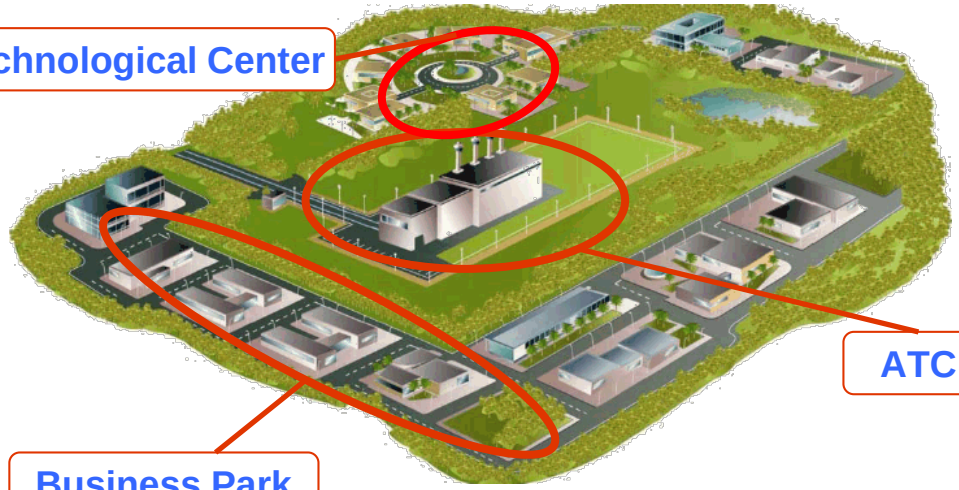
WEC scope

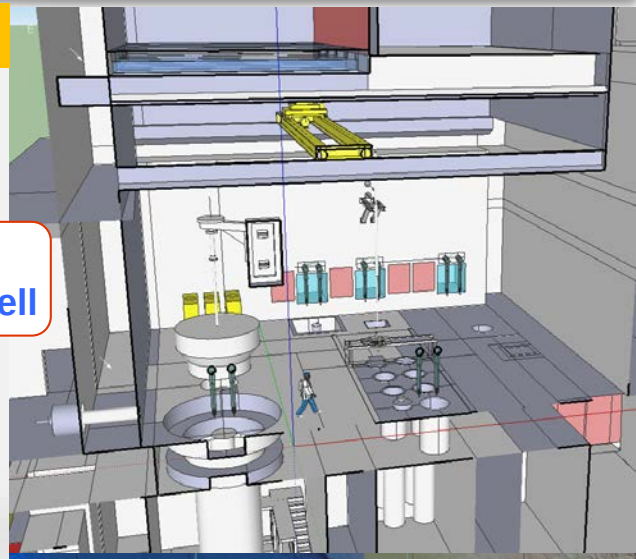
- Civil engineering
- Radiological calculations
- Licensing support
- Safety analysis



« ATC » Centralized Interim Storage for Spent Fuel (Spain)

Dry Storage





WEC's involvement

Detailed facility design, licensing support, safety analysis report, construction supervision

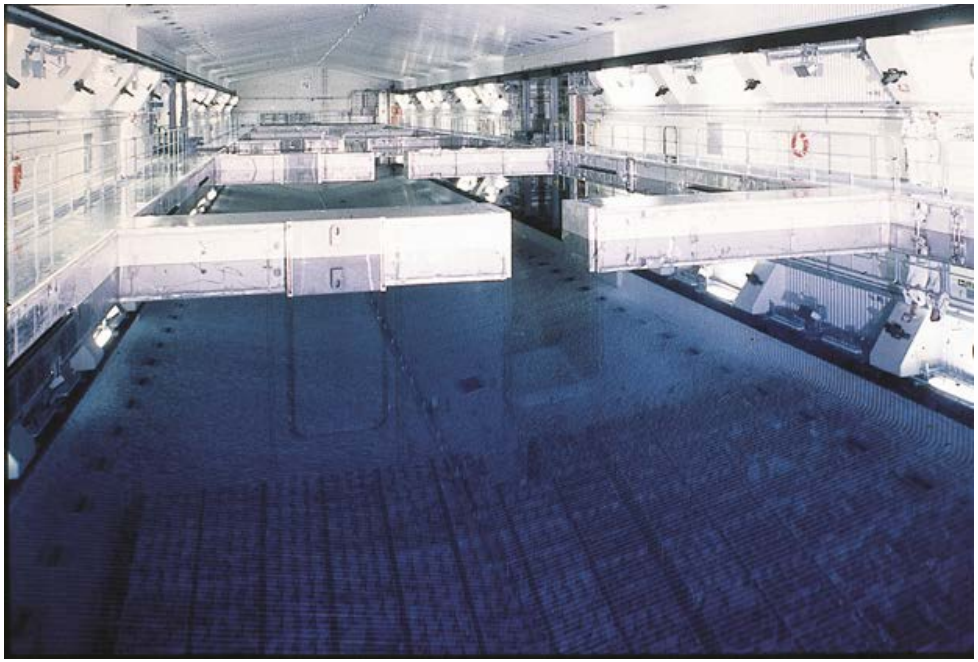
Westinghouse

Dry Storage

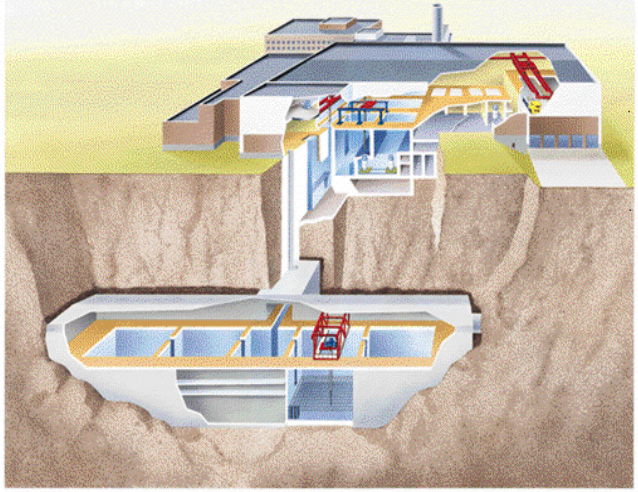
CLAB Central Intermediate Storage Facility for Spent Fuel (Sweden)

Activities covered

- ✓ Design
- ✓ Safety analysis report
- ✓ Commissioning and installation supervision
- ✓ Licensing support
- ✓ Equipment supply



Wet Storage



Wet Storage

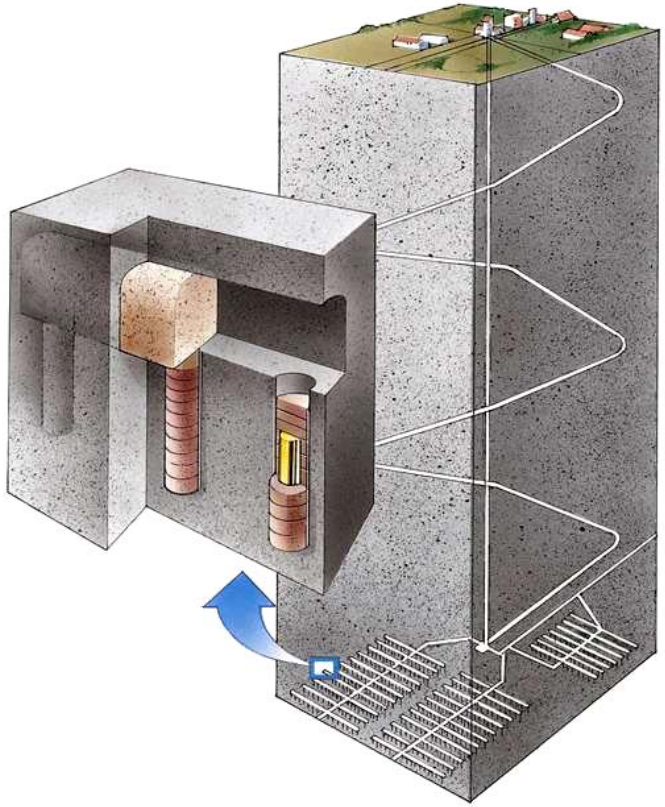
Final Repository for Spent Fuel

- **Forsmark (Sweden)**

  Pre-basic design of handling system for canisters and other materials,
  basic design of activity / radiation monitoring systems

- **Spanish Spent Fuel Repository**

  Performance assessment studies and conceptual design for deep geological fuel disposal facility (granite and clay host rocks)



Summary

Westinghouse is *presently offering:*

- Global experience as fuel supplier
- Advanced Technologies to cope with specialized services (e.g. interim storage of damaged Spent Fuel)
- Interim Spent Fuel storage facilities experience for dry and wet solutions
- Large presence in Europe from fuel manufacturing to interim storage and disposal

Westinghouse is *now expanding its capabilities into Spent Fuel design and licensing.*