Status of Dry Storage Projects in Taiwan

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November 15, 2010
At ISSF 2010, Tokyo, Japan

Outlines

- Dry Storage in Taiwan
- Chinshan Dry Storage Project
- Kuosheng Dry Storage Project
- Concluding Remarks

Dry Storage in Taiwan: Nuclear Power Plants

Each plant with two identical units, and spaces for 2-4 units more

Chinshan (BWR-4, Mark I)

Kuosheng (BWR-6. Mark III)

Lungmen (under construction, ABWR)

Ma-An-Shan (PWR)

Dry Storage in Taiwan: Nuclear Power Plants (cont.)

- Nuclear is 12.8% of the total installed capacity but generates 20.7% of the supplied electricity (193.6 billion kwh total in 2009)
- Taiwan Power Company (TPC) relies on NPP to make a better financial balance, especially in the recent years

Dry Storage in Taiwan: Needs for space to store SF

- Chinshan started commercial operation in 1978/1979 with typical Spent Fuel Pools, had been re-racking twice for more spaces. Need at least 100 more spaces for SF to have a smooth outage on Feb. 2013.
- Similar conditions for Kuosheng (commercial operation from 1981/1983), pools will be full by 2016.
- With less fuel assemblies in core and larger SFP, Ma-An-Shan can still survive within its license life time (2025/2026).
- All plants need to deal with fuel storage issues after decommissions

Dry Storage in Taiwan: Roles of TPC and INER

- TPC is the only (state-own) power company in Taiwan, while INER is the only nuclear-related research organization.
- Although INER is under the supervision of the Atomic Energy Council (AEC), when needed, INER is obligated to support TPC in nuclear related activities.
- INER may become an institution under the Ministry of Economy and Energy in early 2012, as parts of the government re-organization.

Chinshan Dry Storage Project: Background

- TPC initiated the bidding processes in 1995, after four biddings, no contract has been executed
- INER showed interest in contracting the project in 2004, after one year negotiation on commercial and technical terms, TPC entrusted INER in July 2005.

Chinshan Dry Storage Project: What have been done

- With considerations of the size of the nuclear industry in Taiwan and limited time allowed, both parties agreed to adopt the Technology Transfer approach.
- NAC's UMS system was chosen, some design modifications were done to accommodate the site specific features and limitations:

  -AOS (Add-On-Shield) surrounding VCC to fulfill the stricter dose rate limitation at site boundary

  -Thickness of the shielding of TFR was cut down for l" to match with the crane capacity

  -Changes and modifications made on some handling tools for site specific needs

Chinshan Dry Storage Project: What have been done (cont.1)

- The SAR (Safety Analysis Report) was approved by AEC on November 2008.
- Fabrications of 25 canisters (TSC) and one TFR (Transfer Cask) plus auxiliary lifting and protection devices were completed by August 2010.
- Carrier for VCC (Dolly) was tested early this year, further tests will be conducted later this year

Chinshan Dry Storage Project: What have been done (cont.2)

- Mock-up for auto-welding of lids, VDS (vacuum & drying system), and underwater activities were almost completed at INER
- Some specific earthquake proof framework designed and fabricated, to relieve concerns on operational safety

Chinshan Dry Storage Project: Milestones

- Local government approved the Water & Soil Conservation Plan in September this year: four years behind the schedule
- Major milestones:

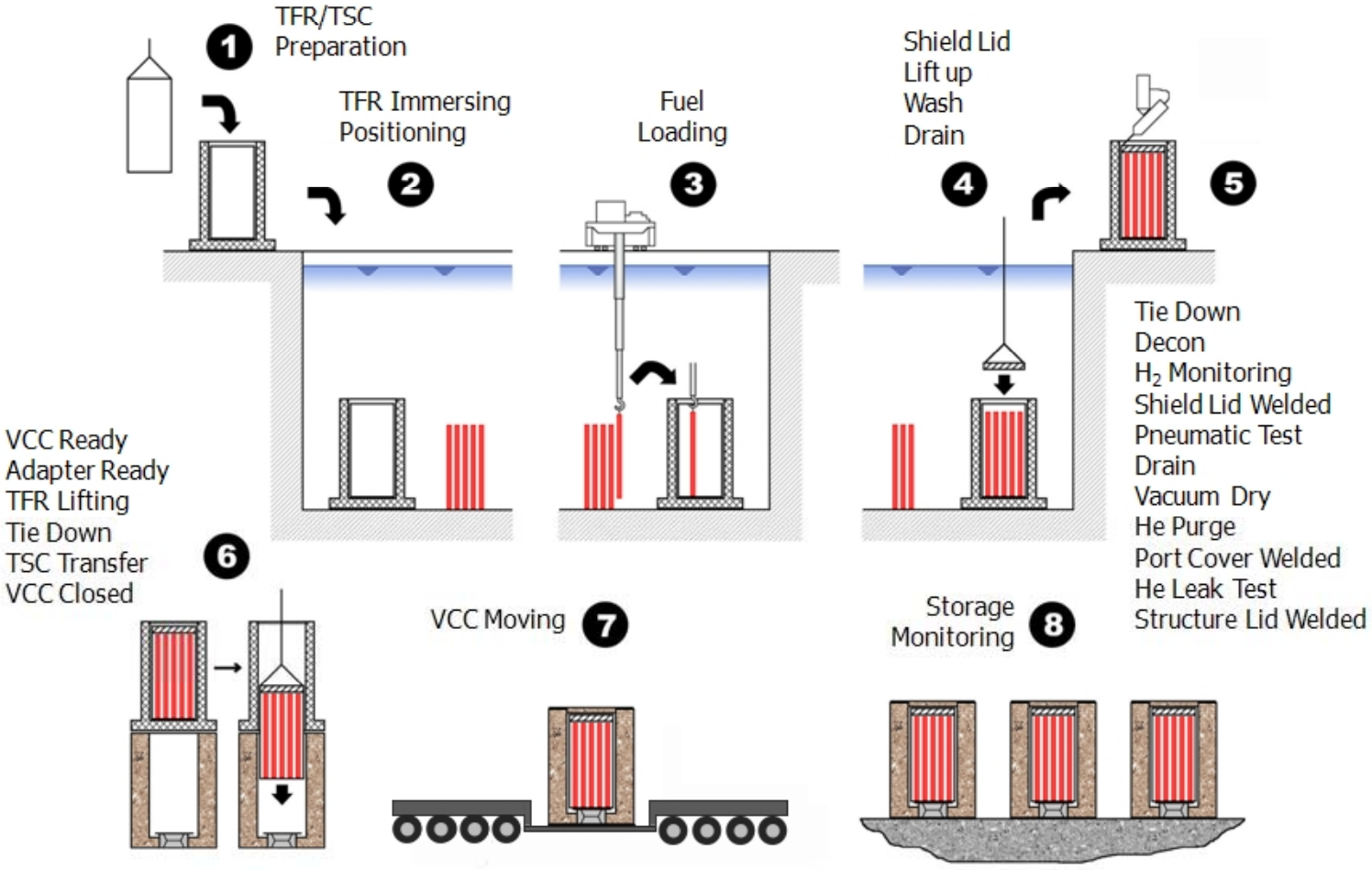
  - Completion of ISFSI Pad: May, 2012

  - Dry Run at site: Jan. to April, 2012

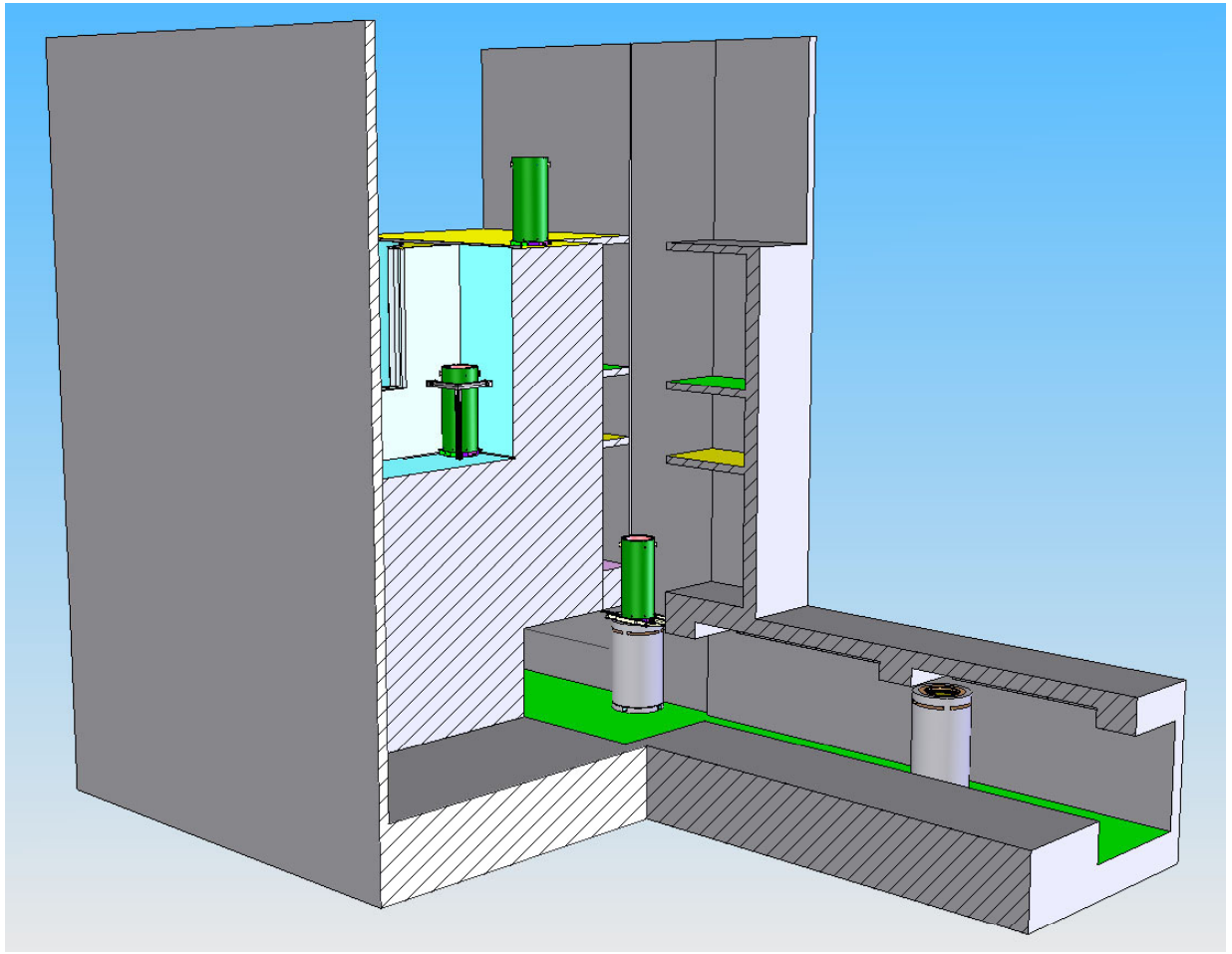
  - Hot Test (loading of the first two casks): May to Sep. 2012

  - Completion of 25 cask loading: early 2015

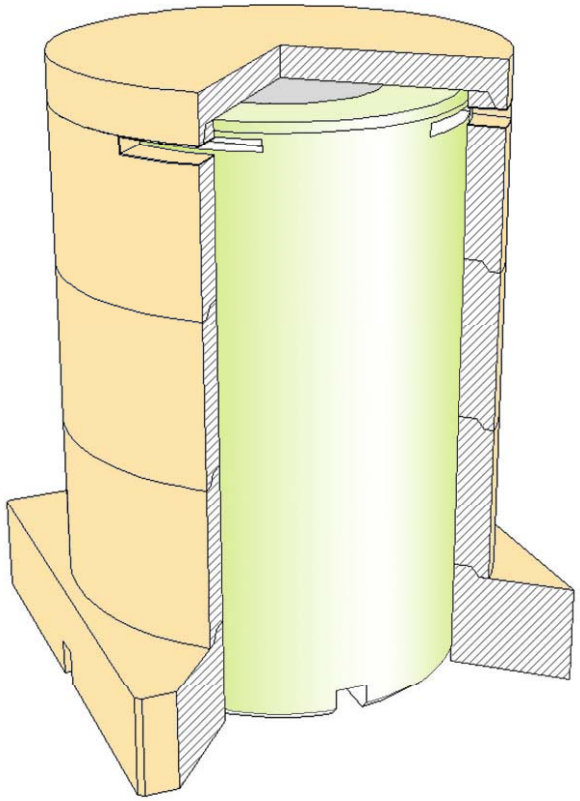
Chinshan Dry Storage Project: Loading Sequence



Chinshan Dry Storage Project: Loading inside Reactor Bldg.



Chinshan Dry Storage Project: Add On Shield (AOS)

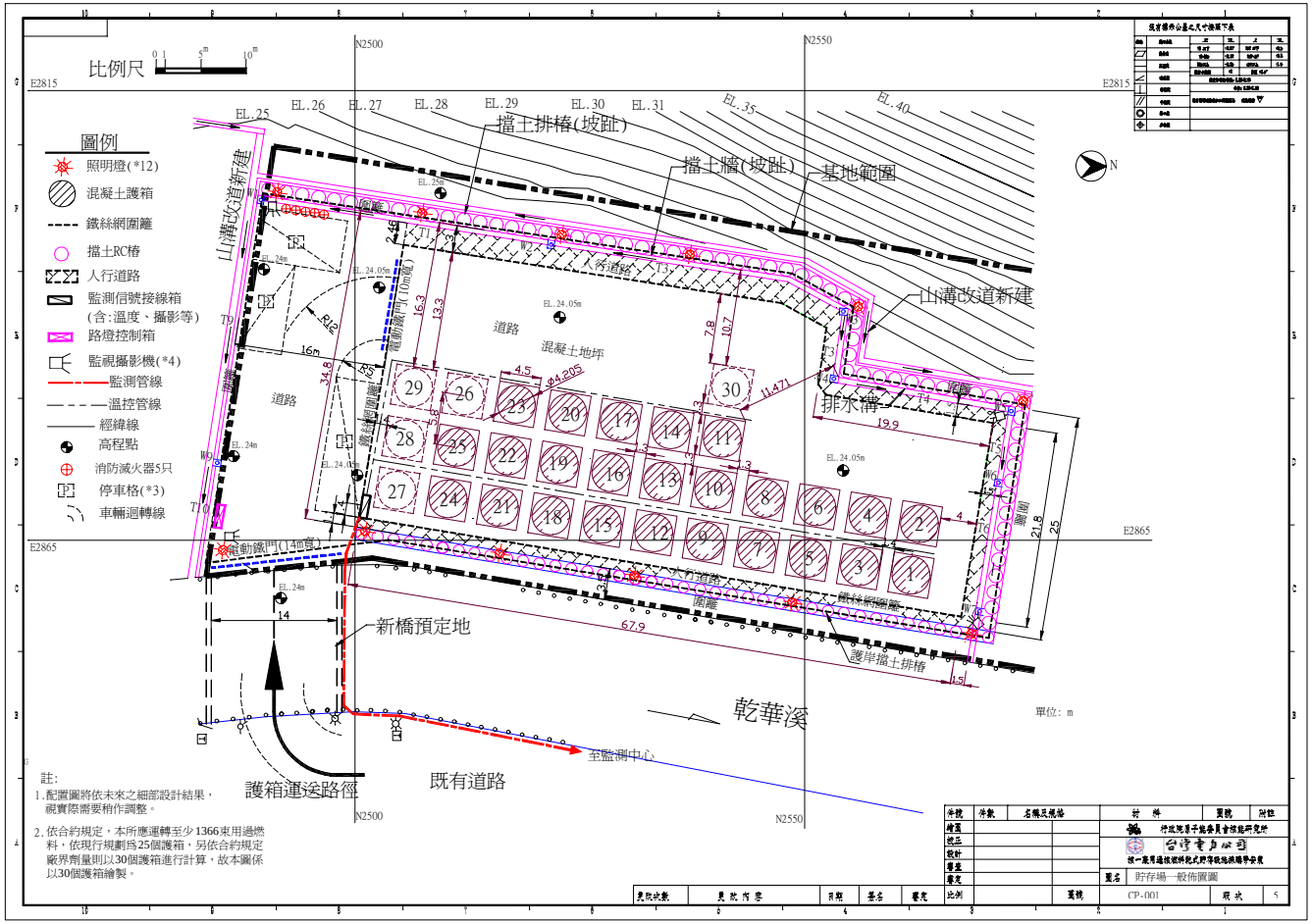


-Five layers for ease of fabrication and installation
--Thickness: 35 cm (30 cm for the top layer)
--Square shape of the bottom layer for earthquake proof consideration

Chinshan Dry Storage Project: Low-Deck Dolly (I)

Chinshan Dry Storage Project: Low-Deck Dolly (II)

Chinshan Dry Storage Project: Pad Layout



Chinshan Dry Storage Project: Mock-up for SFP activities

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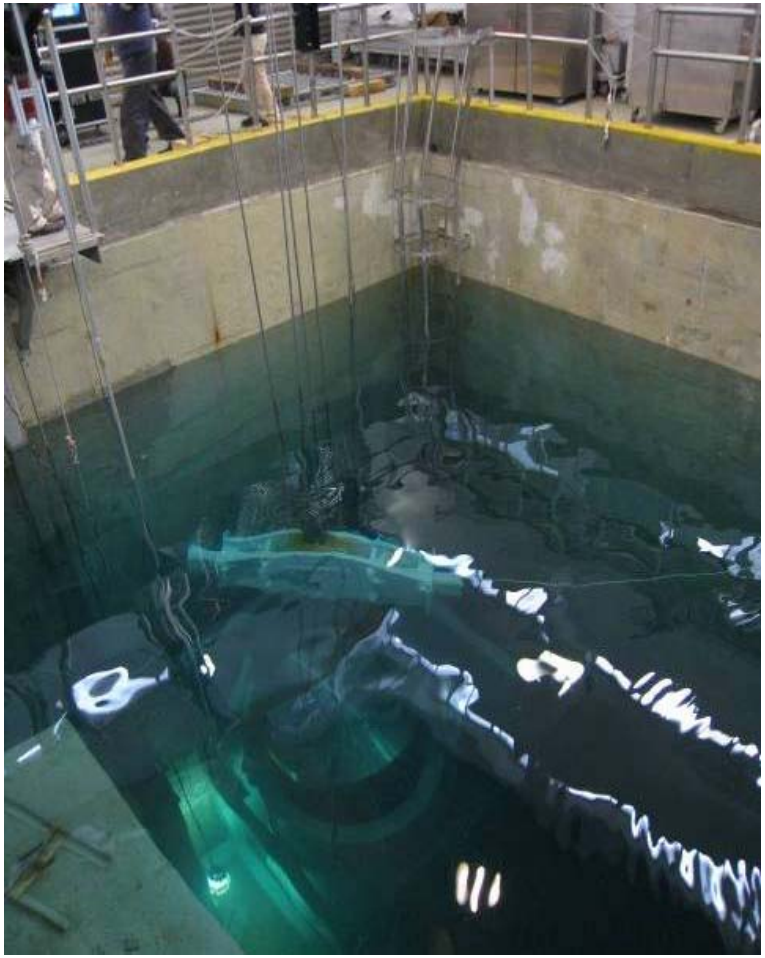
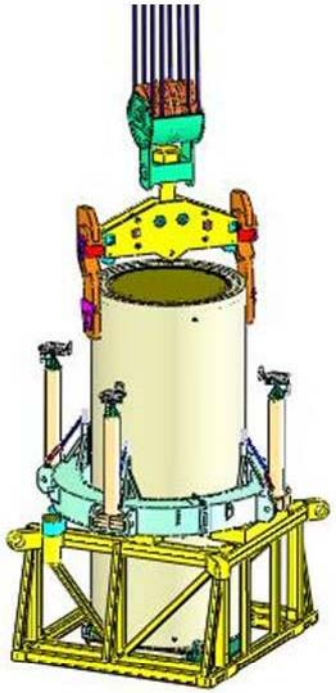


5.5 meters from water surface to the top of the mock-up TFR

Chinshan Dry Storage Project: Earthquake Proof Framework



Earthquake proof framework for TFR during canister transfer

二樓防震與五樓防震設施

Earthquake proof framework for TFR at the wash-down area near the SFP

Kuosheng Dry Storage Project: Status

- International open bid: 2300 to 2400 fuels stored, a turn-key project (same as Chinshan)
- Two tenders: HOLTEC, NAC and CTCIM team
- First two cask loading: ~ end of 2014
- Completion of project: ~ Feb. of 2018

Concluding Remarks

- When entrusted for Chinshan Project, INER's major goal was set as "assist local industry to build up the capabilities in dry storage business." CTCIM was the subcontractor for TSC and TFR fabrications in Chinshan project.
- INER will continue to be active in the areas of licensing application preparation and loading campaign .
- Excluding Lungmen, before decommission, but with life extension for 20 years, revenues for dry storage in Taiwan is ~ 800 millions US dollars. Local industry can be subcontracted for ~ 60%.