

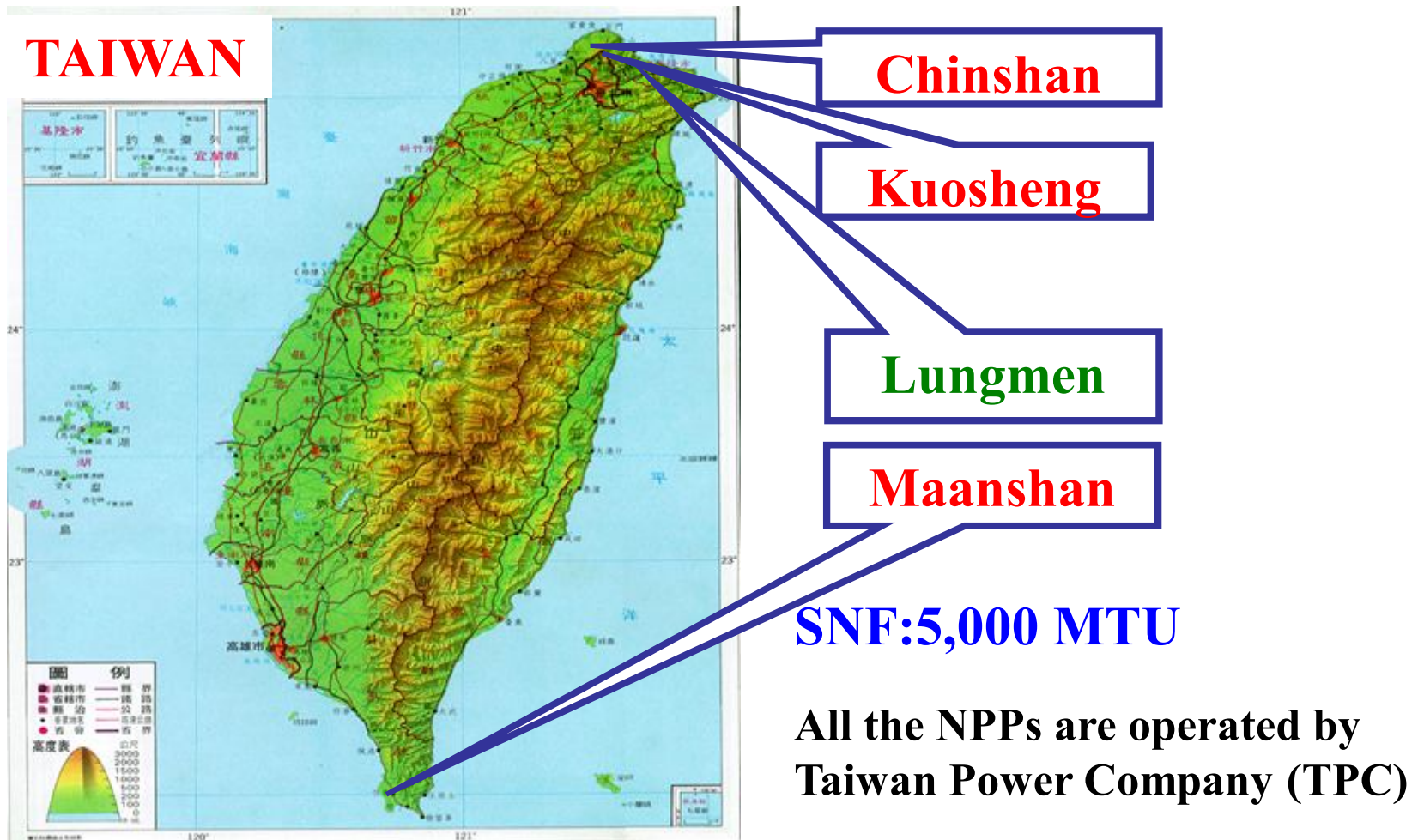
Licensing program and public involvement of spent nuclear fuel dry storage in Taiwan

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Outline

- ❖ Introduction
- ❖ Spent nuclear fuel (SNF) dry storage licensing program
- ❖ Public involvement
- ❖ Spent nuclear fuel off-site transportation
- ❖ Summary remarks



Locations of nuclear power plants in Taiwan



Capacity of spent fuel pool at NPPs

Spent Fuel Storage Status (July 2016)					
Unit		Year Of Commercial Operation	Capacity (Assembly)	Storage Inventory Fuel Assembly	Full discharge per cycle
Chinshan	#1	1978	3,083	3,074	~110
	#2	1979	3,083	3,076	~110
Kuosheng	#1	1981	4,398	4,364	~180
	#2	1983	4,398	4,388	~180
Maanshan	#1	1984	2,160	1,311	~70
	#2	1985	2,160	1,407	~70



Spent fuel dry storage licensing program

- ❖ Two steps licensing process in Taiwan :
 - Construction License
 - ◆ Based on the Preliminary Safety Analysis Report, PSAR and public hearing
 - Operation License
 - ◆ Based on the Final Safety Analysis Report, FSAR





Licensing for the Chinshan dry storage project

- ❖ TPC entrusted the Institute of Nuclear Energy Research (INER) to construct the Chinshan dry storage facility in July 2005.
- ❖ INER decides to introduce a concrete cask system (INER-HPS)
 - Technology transfer from NAC International
 - Design changes made by INER and fabrication in Taiwan
 - 56 BWR assemblies each cask.
 - 30 casks loading 1,680 spent fuel assemblies in total



Components of INER-HPS system



TSC

OD 1.70 m
Ht. 4.84 m
Wt. 16.65 mt



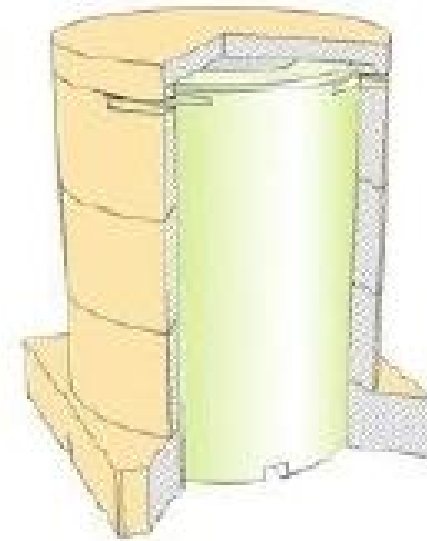
TFR

OD 2.12 m
ID 1.72 m
Ht. 5.13 m
Wt. 46.18 mt



VCC

OD 3.45 m
ID 1.89 m
Ht. 5.70 m
Wt. 112.73 mt



AOS

OD 4.20 m
Ht. 6.03 m
Wt. 81.20 mt
Wall think 0.35 m



Progress of the Chinshan dry storage project

- ❖ Mar. 2007
 - TPC submitted an application for the construction license.
- ❖ Dec. 2008
 - AEC issued the construction license.
- ❖ May. 2012
 - AEC approved the pre-operational test plan of TPC
- ❖ Jan. 2013
 - TPC completed the first stage pre-operational test (Cold test).



Progress of the Chinshan dry storage project

❖ Sept. 2013

- AEC approved the test result report in September 2013, and agreed that TPC may carry out the second stage pre-operational test (Hot test).

❖ Now

- TPC is unable to perform the hot test due to the local county government concerning the soil and water conservation plan of the facility.



First stage pre-operational test





Licensing for the Kuosheng dry storage project

- ❖ TPC entrusted the CTCI Machinery Corporation (Taiwan) and NAC International (USA) to construct the facility in Nov. 2010
- ❖ NAC MAGNASTOR storage system
 - 87 BWR assemblies each cask.
 - 27 casks loading 2,349 spent fuel assemblies in total



Components of MAGNASTOR system



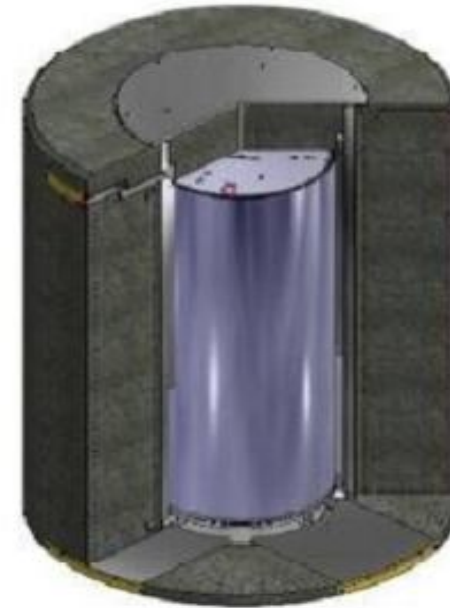
TSC

OD:1.828 m
Ht:4.87 m
Wt: 19.1 mt



TFR

ID: 1.85 m
OD: 2.23 m
Ht: 5.05 m
Wt: 49.0 mt



VCC

ID:1.87 m
OD:4.25 m
Ht:5.99 m
Wt: 183 mt
Wall think:1.02 m



Progress of the Kuosheng dry storage project

- ❖ Mar. 2012
 - TPC submitted an application for the construction license
- ❖ Aug. 2015
 - AEC finished the safety review and issued the construction license
- ❖ Now
 - TPC needs another permission of runoff wastewater reduction issued by the local county government before construction



Public involvement

- ❖ Public Hearings (PH) for SNF dry storage facility
 - Before the issuance of the construction license
 - Chinshan and Kuosheng NPP
- ❖ Public Observation(PO) on SNF dry storage facility
 - In the constructing process
 - Currently only in Chinshan NPP



PH for Chinshan and Kuosheng dry storage facility

- ◆ PSAR was disclosed on website and at local and nearby townships
- ◆ Announcement of PH was released on government bulletin , AEC website and the press
- ◆ Written opinions were collected by postage-paid reply postcard & AEC website by hearing.
- ◆ Preliminary hearings held at a nearby township for scoping the topics argued
- ◆ Formal hearings should ensure all opinions of participants been expressed completely
- ◆ Hearing records was released on AEC Web site



Summary of the PH

- ❖ The pre-operation of SNF dry storage facility must include a mockup simulation of the retrieval operation of SNFs
- ❖ The operator must make sure a facility available for retrieving SNFs in the NPP's decommissioning plan.
- ❖ The maintenance and surveillance plan of the ISFSI shall include the monitoring of stress corrosion cracking (SCC) of the storage facility.
- ❖ Any new survey evidence of fault near the facility area is approved by AEC, the operator must re-evaluate the seismic design of the ISFSI.
- ❖ The storage facility shall be decommissioned when the 40-years license expires



PO on Chinshan dry storage facility

- ❖ Public observation program was initialized by AEC in 2011
- ❖ Observation team :
 - 11 community delegates (village chiefs, directors of community associations, stakeholder representatives)
 - 3 local government officials
 - 2 civil engineering experts
 - 4 environmental NGO delegates



Public Observation Activities



Communication meeting



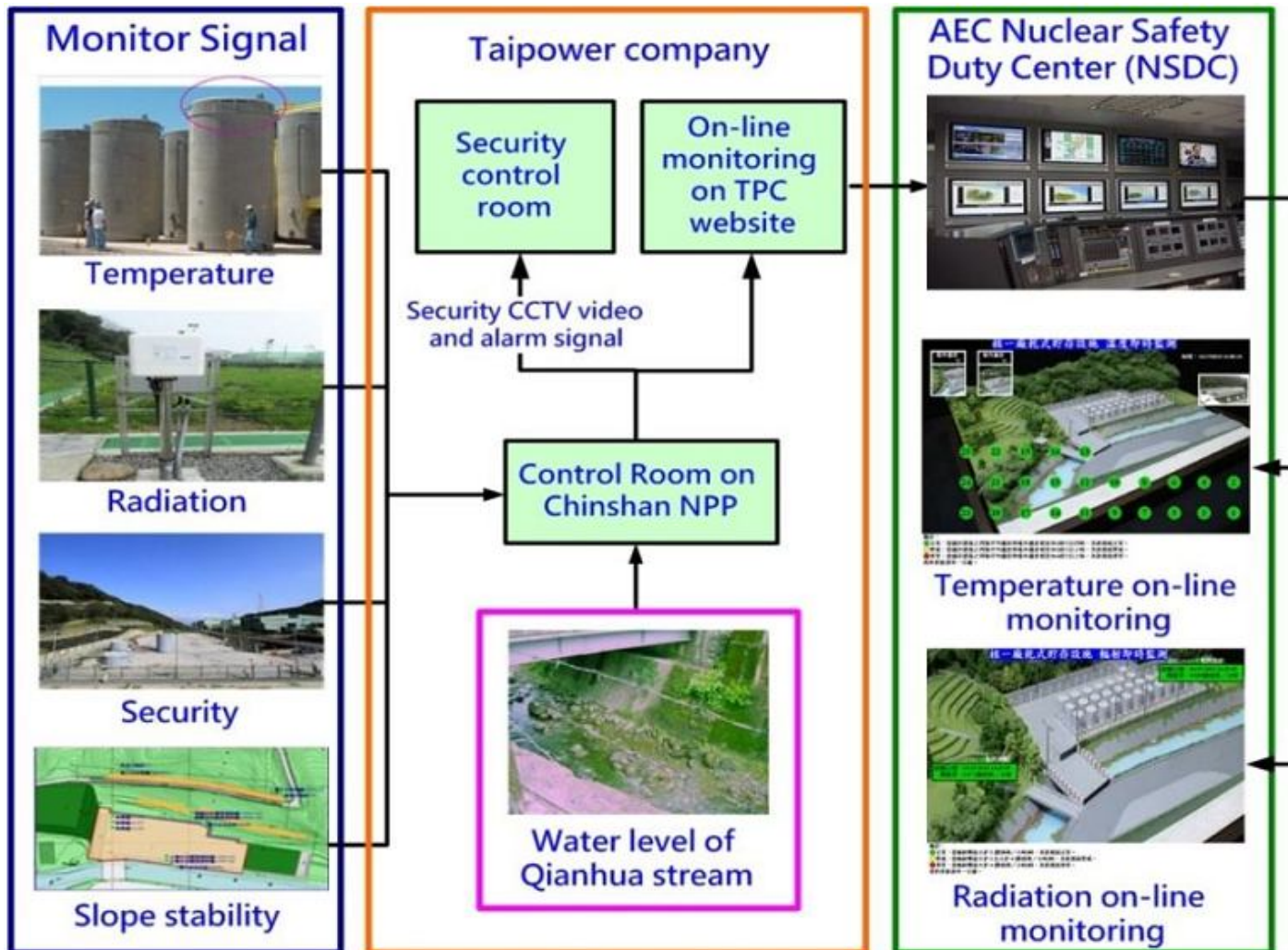
Radiation monitoring



Site visiting



Radiation monitoring



Monitoring system of the dry storage facility at Chinshan NPP



SNF off-site transportation

- ❖ The feasibility of the off-site transportation at Chinshan and Kousheng NPPs have been studied by TPC and submitted to AEC in .
 - Transport route planning
 - The bearing weight of the road and the bridge
 - Shipping boat and shipping port
- ❖ After strict review, AEC found the feasibility studies were acceptable.
- ❖ TPC still needs to submit the completely program to AEC before shipping the SNF.



Summary remarks

- ❖ The Chinshan and Kuosheng NPP will start decommissioning in 2018 and 2021, respectively.
- ❖ The spent fuel management is not only technical but also social issue that needs patience and time to resolve.
- ❖ AEC have promoted many public involvement activities to enhance the public confidence for the dry storage project.
- ❖ In the future, various communication platform will continue to be created to build the consensus and let the NPP decommission would be carried out smoothly.



行政院原子能委員會
Atomic Energy Council

Thank you for Your Attention!

