2010 AEC-NRC Bilateral Technical Meeting

Chinshan ISFSI Pre-Op Inspection Plan

May 3, 2010

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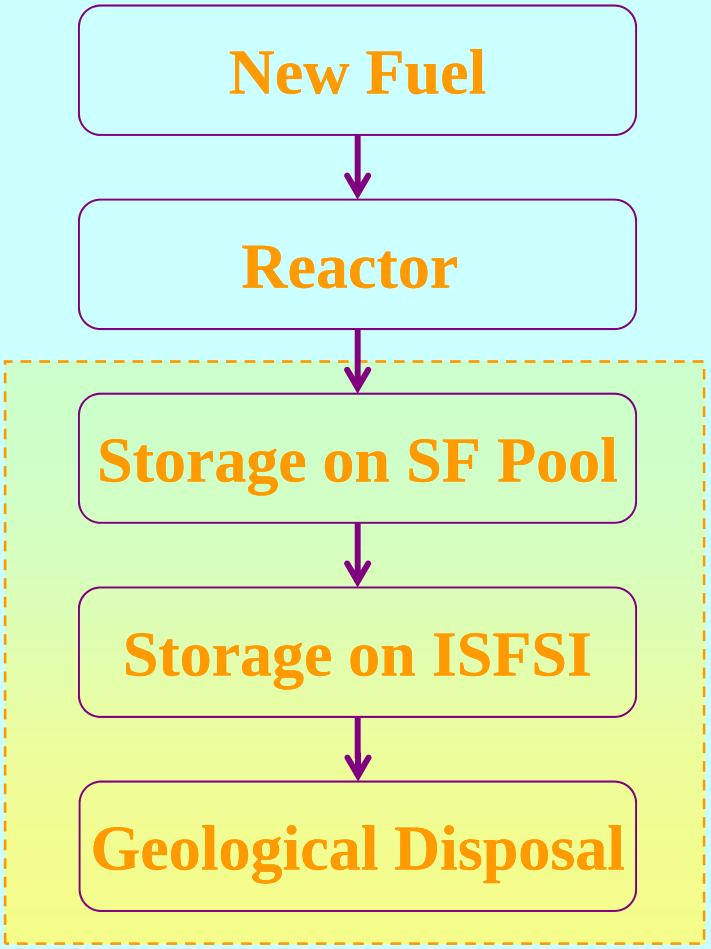
Outline

- Introduction
- Regulatory Requirements
- Inspection Plan for Pre-Op Testing
- Concluding Remarks

Introduction (1)

- Estimated 7,350 metric tons spent fuel will be produced in Taiwan.
- Management Strategy on Spent Fuel
  - Near term: pool storage
  - Medium term: on-site dry storage
  - Long term: deep geological disposal



Introduction (2)

- TPC commissioned INER in July 2005 to implement on-site ISFSI project
- The INER-HPS dry storage system was developed
  - Technology transfer from NAC International.
  - loading and storage of 1,366 spent fuel assemblies (25 casks in total).

Introduction (3)

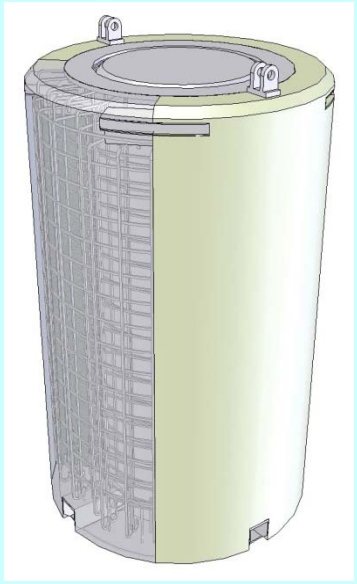
Components of INER-HPS

Canister(**TSC**)

OD 1.70 m
Ht. 4.84 m
Wt. 16.65 t

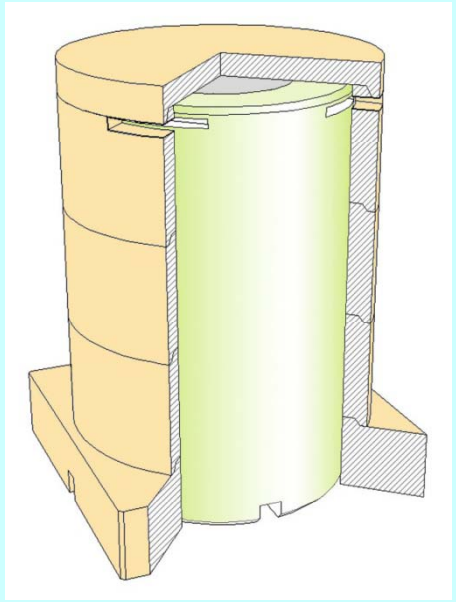
Transfer Cask(**TFR**)

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



Concrete Cask (**VCC**)

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



Add-on Shield (**AOS**)

Sq. foot 4.5 x 4.5 m
OD 4.20 m
Wall thk. 0.35 m
Ht. 6.03 m
Wt. 81.20 t

Introduction (4)

- Approval conditions of ISFSI in Taiwan
  - Environment
    - The Environmental Impact Statement (EIS) for review and approval
    - Competent authority: EPA
    - The EIS has been approved in November 2008
  - Nuclear Safety
    - The Safety Analysis Report of ISFSI to apply for Construction License
    - Competent authority: AEC
    - The Construction License of Chinshan ISFSI has been issued in December 2009.

Introduction (5)

- Slopeland Exploitation
  - The Soil and Water Conservation Plan to apply for Exploitation Permit
  - Competent authority: local government (Taipei county)
  - The safety review is ongoing
  - Predicting the review work will be finished in the end of May 2010.

Regulatory Requirements (1)

- Operational safety
  - Countering safety-related DBA (design basis accident)
    - ✓ Construction License (PSAR)
    - ✓ Pre-operational testing
    - ✓ Operating License (FSAR)
- Security
  - Be typically designed and evaluated against a DBT (design basis threat)
- Safeguards
  - According to IAEA criteria

Regulatory Requirements (2)

- Operational safety
  1. Nuclear Materials and Radioactive Waste Management Act
  2. Regulations on the Review and Approval of Applications for Construction License of Radioactive Wastes Treatment, Storage and Final Disposal Facilities.
  3. Guidelines on the Safety Analysis Report for the Application of Spent Nuclear Fuel Dry Storage Facility.

Regulatory Requirements (3)

- Security
  - Physical security plan for Chinshan NPS, (Standard Operation Procedure No.106)
  - Draft technical basis for updating the ISFSI security requirements. (74 FR 66589, Dec. 16, 2009)
- Safeguards
  - IAEA safeguards criteria
  - Operational Regulations Governing Nuclear Safeguards, AEC

Regulatory Requirements (4)

- Facility Safety
  - Radiological protection shall ensure the annual effective dose $\leqq$ 0.25 mSv
    - TPC's design criteria $\leqq$ 0.05 mSv/annual
  - Surveillance program shall meet the Technical Specifications of ISFSI.
    - ✓ I/O difference of temp. sensors $\leqq$92ºF (33ºC)
    - ✓ Site-boundary radiation detection (0.05mSv)
    - ✓ Security monitoring system
    - ✓ A response surveillance is required after the occurrence of an off-normal, accident, or natural phenomena event within 4hrs

Regulatory Requirements (5)

- A dry run training exercise is demanded
  - Even after the completion of the construction of ISFSI, the ISFSI shall not be formally operated, until the AEC has approved and issued an Operating License
  - Before applying for Operating License of ISFSI, the applicant shall submit a pre-operational testing program to the AEC

Inspection Plan for Pre-Op testing (1)

- FCMA has developed a series of inspection guidance
  - Determine by direct observation and independent evaluation
    - TPC must demonstrate the ability to perform preoperational requirements specified in the SAR and Technical Specifications.
    - TPC must demonstrate the ability to both load and unload a cask before beginning the loading campaign.
    - TPC must integrate all the participants in the demonstration, including operations and radiation protection.
  - Reference from NRC IP 60854, 60856, 60857

IP 60854- Preoperational Testing of an ISFSI
IP 60856- Review of 10 CFR 72.212(b)
IP 60857- Review of 10 CFR 72.48

Inspection Plan for Pre-Op testing (2)

- A dry run training exercise on loading, closure, handling, unloading, and transfer of the INER-HPS system shall be conducted prior to the first use of the system to load spent fuel assemblies.
- TPC scheduled the Pre-op testing programs according to the Technical Specifications for the INER-HPS system.
- Pre-op testing including dry run and hot test will be performed around Jan. 2011 so far.

Inspection Plan for Pre-Op testing (3)

- The dry run shall include
  - Fluid operations/welding (canister mock-up)
    - pressure testing
    - vacuum drying
    - Helium backfilling
    - Welding and weld inspection
    - Leak testing for the confinement
  - Heavy load movement
    - Moving the VCC into its designated loading area
    - Moving the TFR containing the empty TSC into the pool
    - TFR+TSC movement through the designated load path

Inspection Plan for Pre-Op testing (4)

- Transfer of the TSC to the VCC
- Transport of the VCC to the ISFSI
- Installing the AOS
- TSC removal from the VCC

- Wet operations (SFP and dummy fuel movements)
  - Insertion and removal of a dummy fuel assembly in the most extreme canister locations
  - Installing the shield lid and handling of the TFR under the pool
  - Operating procedures shall accurately reflect the dose and contamination limits imposed by the technical specifications
  - Canister unloading, including reflooding and weld removal

Inspection Plan for Pre-Op testing (5)

- Hot test (2 casks loading with genuine fuel)
  - The heat transfer characteristics and performance of the INER-HPS system shall be recorded by air inlet and outlet temperature measurements.
  - Comparison of the calculated temperatures of the INER-HPS system heat load to the measured temperatures shall be presented.

Concluding Remarks

- Pre-op testing shall verify the functionality of all equipment, the procedures used for loading and unloading activities, and personnel qualifications before actual movement of spent fuel.
- IP 60854 provides sufficient materials to carry out the inspection activities.
- Lessons learned from technical exchange with NRC Staff is definitely valuable resource to upgrade the safety of loading campaign.

Thanks for your attention.

Inspection Plan for Pre-Op testing (2)

- Personnel training
  - Job-training on Welding and NDT courses
  - ASME Code training courses
- Lessons learned from technical exchange
  - Canister manufacture inspection workshop presented by Japanese experts in Dec. 2007
  - Workshop on inspection on spent fuel dry storage facility presented by NRC experts in Dec. 2008.