Prairie Island Independent Spent Fuel Storage Installation Thermal Conductance License Amendment Request Post-Submittal Meeting

Rockville, Maryland

September 11, 2012

Attendees

NSPM

- Mike Baumann – Director, Nuclear Fuel Supply
- Tim Morrison – Supervisor, Spent Nuclear Fuel Projects
- Oley Nelson – Engineer, Spent Nuclear Fuel Projects
- Brian Zelenak – Manager, ISFSI Licensing

Transnuclear

- Peter Shih – Director, Design Engineering
- Don Shaw – Manager, Licensing
- Slava Guzeyev – Engineer, Thermal Analysis
- Venkata Venigalla – Engineer, Thermal Analysis

Agenda

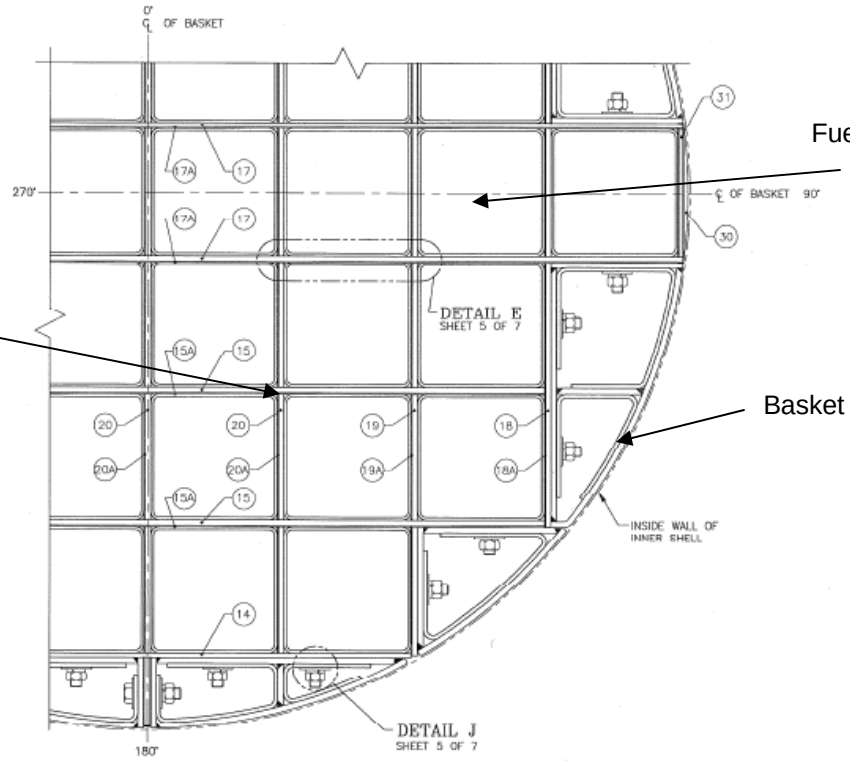
- Introductions
- Purpose of Meeting
- Background
- Proposed Changes
- Reason for Amendment Request
- Thermal Analysis
- Summary
- Discussion / Q&A

Purpose Of Meeting

- Explain the Reasons for and Benefits of the LAR
- Explain Proposed TS and SAR Changes
- Discuss Supporting Thermal Analysis
- Answer Staff Questions

Background

TN-40HT Cask Basket Design



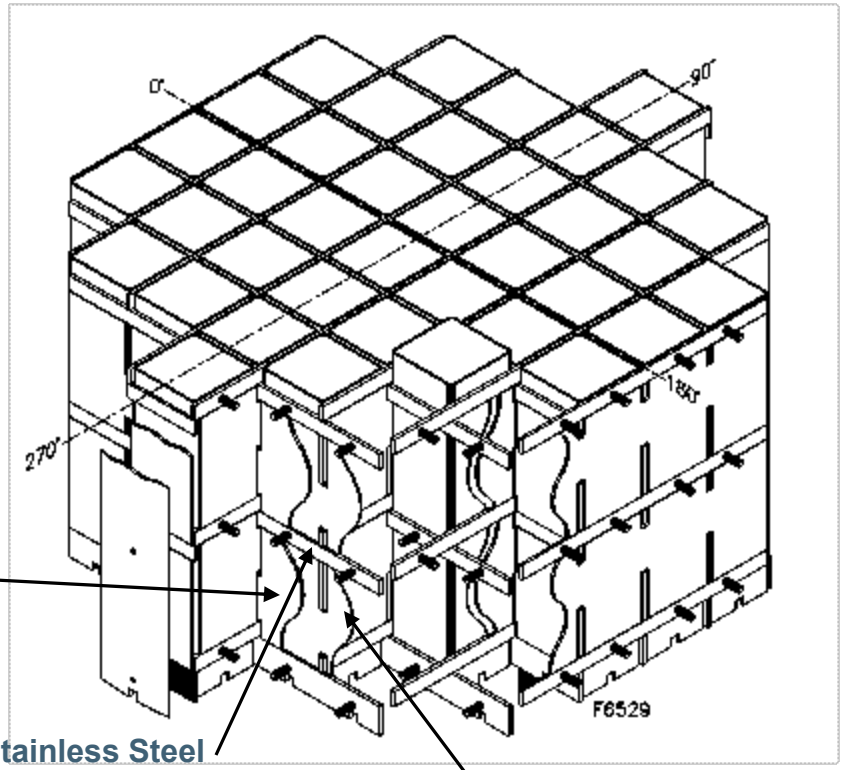
Fuel Compartment

Aluminum and Poison Plates

Basket Rails

Background

TN-40HT Cask Basket Design



Background

- TS 4.3.2.b Requires Thermal Conductivity Testing of Neutron Absorbers
- Requires Minimum Poison Plate Conductivity such that Total Conductance (Sum Of Conductivity * Thickness) of Poison and Aluminum Plates be ≥ 3.98 Btu/hr-ºF

Background

- Fabrication of First Three TN-40HT Baskets
  - Utilized Flexibility Provided in Design Drawings
  - As-Fabricated Baskets Would Not Meet TS 4.3.2.b
- Baskets Satisfy all Design Bases Functions Except for Compliance with TS 4.3.2.b
- Delayed 2012 Cask Loading Until 2013
- Fabricating Baskets That Will Meet the Current TS 4.3.2.b Requirements for the 2013 Loading

Proposed Changes

- New SAR Section
  - Lower Conductance Thermal Evaluation
  - Demonstrates All Temperature Limits are Met and Bounded by Previous Thermal Analysis
- Analysis Performed Using ANSYS Version 10.0
- TS 4.3.2.b Minimum Thermal Conductance of Poison and Aluminum Plates from 3.98 to 3.55 Btu/hr-ºF

Proposed Changes

- **TS 4.3.2.b Nominal Thickness of Aluminum Plate at which do not need to Perform Thermal Conductivity Testing on Poison Plate is changed from 0.359 to 0.320 inches**

- **TS Table 4.3-3 Conductivity and Conductance Values, Based on Change to TS Section 4.3.2.b**

Reasons for Amendment Request

- **Flexibility for Future Manufacturing**
  - **Will Not Require Special Order Aluminum Plates**
  - **Reduces Potential Fabrication Challenges**
  - **Fewer Challenges Result an a Higher Quality Baskets**
  - **Increases the Number of Poison Plate Suppliers**
- **Allows Use of Three Fabricated Baskets**

Reasons for Amendment Request

- Requested Approval Date of 5/1/13
  - Supports Future Cask Fabrication and Loading Campaigns Scheduled for Spring of 2014
  - Decision Point Based on the Time Required to Build and Deliver Casks with New Baskets

Thermal Analysis

Objectives

- Re-analyze All Thermal Conditions
- Maintain the Current SAR Analysis as Bounding
- Limit the Effect of Reduction of Poison Plate Conductivity to Thermal Design Functions

Thermal Analysis

Re-Analyzed Conditions

- Normal and Off-Normal
- Accident Conditions
  - Fire
  - Buried Cask
- Vacuum Drying

Thermal Analysis

Thermal Model Used

- Full Length Model Used for Lower Conductance Analysis
  - Full Length Model was Used in SAR to Evaluate Normal/Off-Normal Storage Conditions
  - Cross-Section Model was Used in SAR for Accident / Vacuum Drying Analysis (Saved Computer Memory and Computation Time)
- Full Length Model Provides More Accurate Results
- Analysis Performed Using ANSYS Version 10.0

Thermal Analysis

Thermal Inputs

- Thermal Inputs for Aluminum and Poison Plates Based on Poison Plate Conductivity of 0.68 Btu/hr-in-ºF
  - Equates to Thermal Conductance of 3.55 Btu/hr-ºF (At 70 ºF)
- Transverse Effective Fuel Conductivities in Helium were Changed to the Values in SAR Table A3.3-9
- All Other Material Properties Remain the Same as Pervious SAR Thermal Analysis

Thermal Analysis

Normal / Off-Normal Condition

- No Changes Made to Boundary Conditions
- Maximum Fuel Cladding Temperature Decreased from 680 ºF to 658 ºF (Limit Is 752 ºF)
- Basket Rail Temperature Increased from 459 ºF to 460 ºF
  - Negligible Change for this Component
- No Change in Other Component Temperatures

Thermal Analysis

Fire Accident Condition

- No Changes Made to Boundary Conditions
- Transient Analysis Followed by Steady State Analysis
- Maximum Fuel Cladding Temperature Decreased Slightly from 772 ºF to 769 ºF (Limit Is 1058 ºF)
- Other Component Temperatures Also Decreased

Thermal Analysis

Buried Accident Condition

- No Changes Made to Boundary Conditions
- Maximum Fuel Cladding Temperature at 95.75 Hours Decreased from 1058 ºF to 905 ºF (Limit Is 1058 ºF)
- Other Component Temperatures Also Decreased

Thermal Analysis

Vacuum Drying Condition

- Conservatively Assumes Cask Remains in Spent Fuel Pool with Boiling Water During Entire Vacuum Drying
- Other Boundary Conditions Remain Unchanged
- Maximum Fuel Cladding Temperature at 34 hours Decreased from 725 °F to 628 ºF (Limit is 752 ºF)

Thermal Analysis

Analysis Summary

- **Maximum Fuel Cladding Temperatures Remain Bounded by the Current SAR Evaluations**
  - **Using Lowered Conductivity of Poison Plates (0.68 Btu/hr-in-ºF)**
  - **Using More Accurate Transverse Effective Fuel Assembly Conductivity**
  - **Using Full Length Model Instead of Cross-Section Model for Transient Runs**

Thermal Analysis

Analysis Summary Continued….

- New SAR Section Describes Lower Conductance Analysis
- New SAR Section Concludes that Current SAR Results Remain Conservatively Bounding or Unaffected
- Lower Conductance Results Do Not Replace Existing Results in SAR
- No Impact on the Other Analyses that Use the Thermal Analysis Results as Input

Summary

- Analysis Used Previously Reviewed Thermal Model and Effective Fuel Conductivity
- Results of Current SAR Analysis Remain Conservatively Bounding or Unaffected
- LAR Provides Flexibility that will Reduce Future Manufacturing Challenges
- Request Approval in Time to Support Planning for Future Cask Fabrication and Loading Campaigns
- Proposed Changes Do Not Impact the Health and Safety of the Public

Discussion

Discussion

Q&A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