**UNITED STATES**
**NUCLEAR REGULATORY COMMISSION**
**WASHINGTON, D.C. 20555-0001**

June 18, 2010

LICENSEE: Entergy Nuclear Operations, Inc.

FACILITY: Indian Point Nuclear Generating Unit Nos. 2 and 3

SUBJECT: SUMMARY OF JUNE 11, 2010, MEETING WITH ENTERGY ON THE TRANSFER OF SPENT FUEL FROM UNIT 3 TO UNIT 2 AT INDIAN POINT NUCLEAR GENERATING UNIT NOS. 2 AND 3 (TAC NOS. ME1671, ME1672, AND L24299)

On June 11, 2010, a Category 1 public meeting was held between the Nuclear Regulatory Commission (NRC) and representatives of Entergy Nuclear Operations, Inc. (the licensee) and Holtec International, Inc., one of the licensee's contractors, at the NRC's Executive Boulevard Building, 6003 Executive Boulevard, Rockville, Maryland. The purpose of the meeting was to discuss the NRC staff's request for additional information (RAI) dated April 20, 2010, which is publicly available in the NRC's Agencywide Documents Access and Management System (ADAMS) under Accession No. ML101020486. The NRC's RAI letter was in response to Entergy's license amendment request to authorize the transfer of spent fuel from the spent fuel pool at Indian Point Nuclear Generating Unit No. 3 (IP3) to the spent fuel pool at Indian Point Nuclear Generating Unit No. 2 (IP2) using a newly designed transfer canister. From there, Entergy intends to transfer the spent fuel to the independent spent fuel storage installation which already exists at the site.

The licensee presented information on the methods they would use to respond to the RAI questions. A list of attendees is provided as Enclosure 1, but may not be all inclusive. The licensee's slide presentation is provided as Enclosure 2. There was a short discussion of proprietary material near the end of the meeting, which was closed to the public.

No Public Meeting Feedback forms have been received. Please direct any inquiries to me at 301-415-2901, or by email to John.Boska@nrc.gov.

John P. Boska, Senior Project Manager
Plant Licensing Branch I-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-247 and 50-286

Enclosures:
1. List of Attendees
2. Licensee Slides

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ADAMS ACCESSION NO.: ML101660536

| OFFICE | LPL1-1/PM | LPL1-1/LA | LPL1-1/BC |
|---|---|---|---|
| NAME | JBoska | SLittle | NSalgado |
| DATE | 6/15/2010 | 6/16/2010 | 6/18/2010 |

OFFICIAL RECORD COPY

DATED: June 18, 2010

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UNITED STATES
NUCLEAR REGULATORY COMMISSION

**MEETING ATTENDANCE FORM**

Subject: NRC Meeting With Entergy and Holtec on Fuel Transfer at Indian Point

Date: June 11, 2010    Location: NRC Executive Blvd Building, Room 1B13

**PLEASE PRINT LEGIBLY**

| NAME | ORGANIZATION |
|---|---|
| Robert Walpole | Entergy |
| Thomas Orlando | Entergy |
| John Skonieczny | Entergy |
| Joseph DeFrancesco | Entergy |
| Roger Waters | Entergy |
| John Boska | NRC |
| Scott Sloan | NRC |
| Stefan Anton | ~~NRC~~ Holtec |
| Tammy Morin | Holtec |
| Floyd Gumble | Entergy |
| Kevin Cuthill | Holtec |
| Debu Mitra-Majumdar | Holtec |
| John Griffiths | Holtec |
| Chuck Bullard | Holtec. |
| Brian Gutherman | ACI - Entergy |
| Kent Wood | NRC |
| John Goshen | NRC |
| Matt Yoder | NRC |
| Ron Parkhill | NRC/SFST |
| Geoff Hornseth | NRC/SFST |
| David Tang | NRC/SFST |

Enclosure 1

UNITED STATES
NUCLEAR REGULATORY COMMISSION

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Subject: NRC Meeting With Entergy and Holtec on Fuel Transfer at Indian Point

Date: June 11, 2010 Location: NRC Executive Blvd Building, Room 1B13

**PLEASE PRINT LEGIBLY**

| NAME | ORGANIZATION |
|---|---|
| JOHN PARILLO | NRC NRR/DRA |
| Meraj Rahimi | NRC/NMSS/SFST |
| JENNIFER DAVIS | NRC/NMSS/SFST |
| Ray Larson | NRC/SFST |
| Matthew Hamm | NRR/ITSB |
| Steve Jones | NRR/DSS/SBPB |
| GREG CASTO | NRR/DSS/SBPB |
| Sherwin Turk | NRC/OGC |
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# *Indian Point Energy Center Inter Unit Fuel Transfer Responses to RAIs*

*June 11, 2010*

Entergy

# Introductions

## Entergy Personnel

Thomas Orlando – Director, Engineering

Robert Walpole – Manager, Licensing

Roger Waters – Licensing Engineer

Floyd Gumble – Supervisor, Reactor Engineering

Joe DeFrancesco – Project Manager

John Skonieczny – Senior Engineer

Brian Gutherman - Licensing

# Introductions

## Holtec International Personnel

Stefan Anton – VP Engineering

Kevin Cuthill – Project Manager

Debu Mitra-Majumdar – Program Manager Engineering Analysis

Chuck Bullard – Manager, Structural Engineering

Tammy Morin – Licensing Manager

John Griffiths – Manager, Design Engineering

# Meeting Purpose

Discuss Indian Point’s responses to NRC Request for Additional Information (RAIs) for the Inter-Unit Fuel Transfer License Amendment Request

Note: The information contained in this presentation is intended for discussion purposes only and, as such, has not been through a formal verification process.

# IPEC LAR History

- License Amendment and Supplement submitted 7/08/2009 and, 9/28/2009 respectively.

- Received RAIs on 4/20/2010.

- There are approximately 100 RAIs with the majority in the areas of Criticality (33), Shielding (21), and Thermal Hydraulics (13).

- The resolution of the RAIs requires STC and STC lid design changes, operational changes, and re-analysis. RAI responses will be submitted by October 5, 2010.

# Meeting Agenda

- Overview – S. Anton
- STC Design Changes – J. Griffiths
- Tip Over Analysis – C. Bullard
- Use of Subsection ND – C. Bullard
- Fuel Misload – D. Mitra-Majumdar
- Criticality & Shielding – S. Anton
- Technical Specifications – R. Waters

# Overview

- **Wet Transfer Advantages**
  - Fuel remains in its native wet environment at low temperatures; no risk of cladding damage from thermal transients
  - Water in STC (and HI-TRAC) provides additional shielding
  - Improved heat transfer reduces temperatures and thermal gradients
- **Low Internal Pressure**
  - The normal internal pressure of the STC is only 10 psig, in contrast to canister pressures in the range of 80 to 100 psig that are typical in dry storage
  - Pressure bearing capacity of the STC (design pressure) is over 10 times the normal pressure
  - Misloading detection system (pressure monitoring) before transfer
  - 100% increase in heat load (19.2 kW) results in 50 psig internal STC pressure

# Overview

- **ALARA Considerations**
  - Two independent enclosures, each bolted and sealed, reduces effluent dose
  - Highly effective shielding from two steel-lead-steel casks (water filled) keep estimated dose rates well below Part 71 transport cask limits.
  - High capacity reduces dose to personnel and public

- **Designed for a Full Range of Accidents**
  - Non-mechanistic tip-over
  - Flooding with fresh water
  - Full loss of water; cladding integrity is not challenged

# STC Design Changes

- **Changes related to improved confinement**

  - Double O-ring seal on main lid designed like a transport cask (HI-STAR 60).

  - Redesigned vent/drain connections and new cover plates recessed into lid.

  - New cover plates use O-ring seal.

  - Elimination of additional instrumentation penetrations from lid.

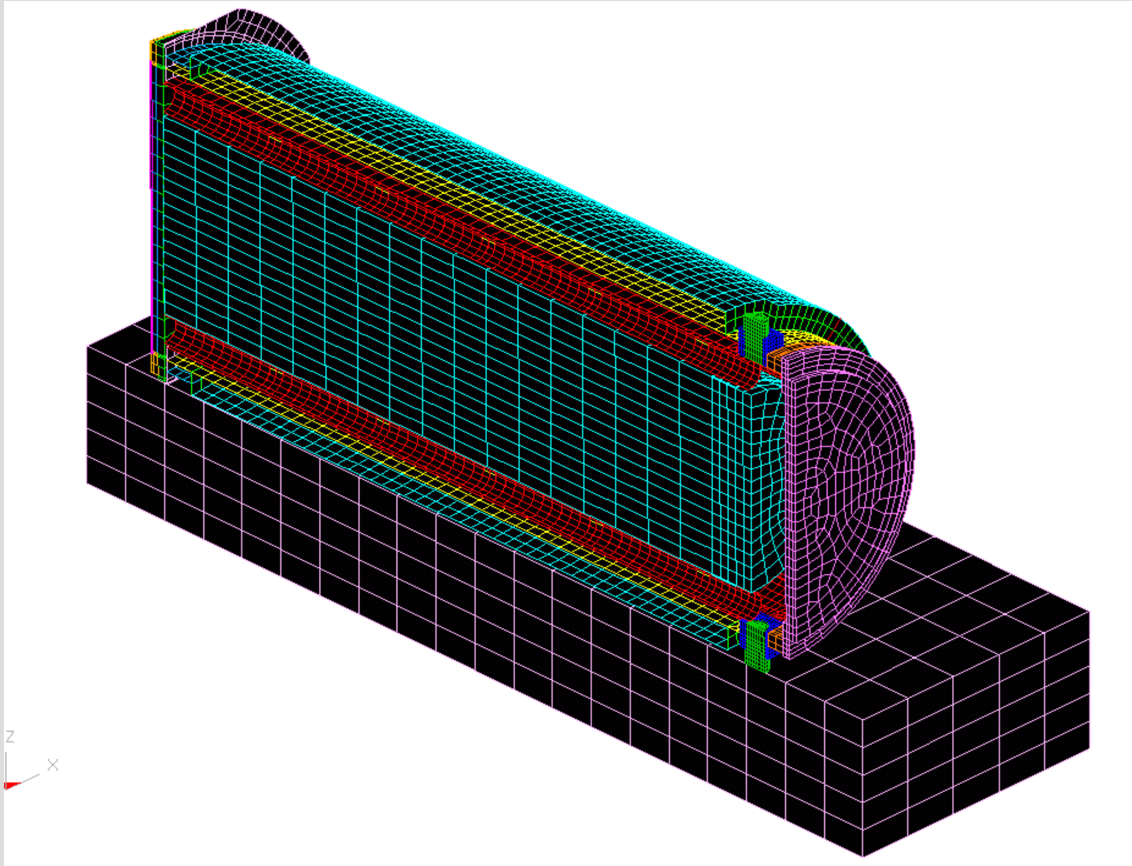
# STC Design Changes

- **Changes Related to Tip-Over Evaluation**
  - Additional shimming in the basket/enclosure to better support the basket.
  - Additional lid bolts to secure lid.
  - Removal of ribs and addition of energy absorbent system

# Tip-Over Analysis (RAI 3-2)

- Non-mechanistic tip-over analysis of HI-TRAC with loaded STC is being performed
- Analysis performed in two parts (similar to HI-STORM 100 tip-over methodology):
  - LS-DYNA used to determine maximum rigid body deceleration of STC; STC modeled as solid homogeneous cylinder
  - ANSYS used to resolve stresses in STC confinement boundary due to maximum impact deceleration
- Target pad assumed to be stiffer than the IPEC haul path
  - 36” thick pad (fixed at base)
  - 6,000 psi concrete
- Energy absorbent system installed in annular space between STC and HI-TRAC to limit maximum rigid body deceleration below 60g (consistent with HI-STAR 100 license)

# Tip-Over Analysis (cont.)



# Use of Subsection ND (RAI 8-8)

- STC is a thick walled fuel transfer device used in conjunction with the HI-TRAC transfer cask to move fuel between IP3 and IP2 Fuel Buildings
- STC is used only during short term operations (not a long-term storage device)
- ASME Subsection ND is the pressure vessel counterpart to Subsection NF, Class 3 (which applies to HI-TRAC and spent fuel racks)
- Use of Subsection ND is not inconsistent with any regulatory requirements governing the STC design

# Use of Subsection ND (cont.)

- For this application, the use of Subsection ND (versus Subsection NB) is conservative because:
  - cyclic fatigue is not a significant concern for STC due to its short-term use and moderate temperature gradients inside the water-filled STC
    - Subsection NB provides higher allowable stress limits in conjunction with an explicit fatigue life evaluation
    - For SA-516 Grade 70 (STC shell material) at 100°F: S = 20.0 ksi (Subsection ND), Sm = 23.3 ksi (Subsection NB)
  - “design by rule” method of Subsection ND requires thicker vessel wall as a result of lower allowables
  - STC confinement boundary welds are substantially larger due to increased shell thickness (e.g., ¾” thick STC inner shell vs. ½” thick MPC shell); more weld passes reduce the risk of a leak
- Selection of ND as the reference code for the STC is also suggested by the code classification of similar pool water bearing equipment under Part 50 (e.g., cooling water system).

# Fuel Mis-load Accident (RAIs 5-7 to 5-10)

- A fuel mis-load event is postulated during fuel transfer from IP3 to IP2.
- To detect fuel mis-load, the current LAR proposes thermocouples on the STC basket to monitor the basket temperature rise.
- Direct measurements by embedded thermocouples is operationally challenging.
- Direct measurements by embedded thermocouples requires additional penetrations through the containment boundary.
- Operational changes will reduce the pressures within the STC.

# Fuel Mis-load Accident (Cont.)

DEFENSE IN DEPTH APPROACHES FOR FUEL MIS-LOAD

- Fuel selection and loading activities will be subjected to independent reviews / verifications prior to fuel transfer activities.

- Pressure gauges and pressure relief valves will be placed in both the STC vent and drain ports while positioned in the HI-TRAC.
  - The pressure inside the STC will be monitored, for a sufficiently long period of time, to ensure that it remains below the design pressure.
  - The relief valves will be set to open when the STC pressure exceeds the design pressure.

- STC/HI-TRAC system will be evaluated for a postulated high heat load mis-load scenario to demonstrate that the STC pressure remains below the STC design pressure.

# IP3 Criticality RAIs

- Inputs
- Methodology
- Benchmarking
- Miscellaneous Questions
- Preliminary Results

# Criticality – Inputs

- Core operating conditions used in depletion calculations will be updated / clarified / justified (RAI 4-4)
- Will use highest hot-channel temperature, which has noticeable impact on fuel reactivity

# Criticality – Methodology

- Principal Codes unchanged (Depletion: CASMO, Criticality: MCNP)
- Tolerances will now be evaluated with MCNP rather than CASMO (RAIs 4-7, 4-10, 4-12, 4-28 through 4-33)
- Additional info on Lumped Fission Products will be provided (RAI 4-5)
  - Consistent with the approach in other Part 50 licensing application
  - New uncertainty will be added
- Pin-specific vs. assembly average fuel composition will be addressed by reference to HI-STAR 100, where such evaluations were performed for MPC-32 (RAI 4-6)
- Consider 5 years cooling time

# Criticality – Benchmarking

- Section 4, Appendix A updated (RAIs 4-18, -20, -22, -23, -25, -26)
- Section 4, Appendix B (CASMO) will be removed (see Methodology)
- RAI 4-21: Requests isotope-by-isotope validation
  - Appears inconsistent with previous and current Part 50 practice
  - Reference to HI-STAR Burnup credit methodology was primarily for CRC Benchmarking
  - Part 50 – 2009 and earlier
    - Fresh Fuel + MOX Criticals
    - 5% depletion uncertainty
  - Part 50 – now
    - Fresh Fuel + MOX Criticals
    - Simulated Spent Fuel Criticals (HTC)
    - 5% depletion uncertainty
    - Irradiation effect on fuel geometry (RAI 4-11)
  - IP3 submittal
    - Fresh Fuel + MOX Criticals
    - 5% depletion uncertainty
    - Added CRC Benchmarks from HI-STAR 100

# Criticality – Miscellaneous

- Metamic Surveillance Program will be included (RAI 4-1)
- Only intact (undamaged) fuel (RAI 4-2)
- Control of operating parameters will be implemented (RAI 4-4)
- Normal condition does not require soluble boron, so loss of borated water would be inconsequential (RAI 4-15)
- Stringent administrative controls to justify assumed accident conditions (RAI 4-17)

# Criticality – Preliminary Results

- **Preliminary analyses indicate no changes to the loading criteria**
  - Initial calculations contained margin
  - Cooling time offsets more conservative parameters (in-core moderator temperatures)

# Shielding - Leak Rates and Effluent Dose Rates (RAIs 7-1,-2,-3,-4,-11,-13)

- Leak Tests
  - STC Lid: Vacuum Leak Test of the inter-seal volume, Leak Rate 1 E-4 atm-cc/sec or better.
  - HI-TRAC Lid: Pressure / Bubble Test, Leak Rate 1 E-3 atm-cc/sec
- Systems with serial configuration of leakage paths
  - Lower leak rate is the upper bound
  - After a sufficiently long time, the lower leak rate governs
  - For short time frames, overall leak rate can be far below the lower value of the individual leak rates
  - For the STC/HI-TRAC system, the leak rate over the first 30 days would be below 1 E-6 atm-cc/sec

# Shielding - Leak Rates and Effluent Dose Rates (cont.)

- Determine STC leak rate acceptance criteria using Transport-Cask-Style analysis (no credit for HI-TRAC).
- Determine effluent dose rates using confinement analysis (credit for STC and HI-TRAC).

# Technical Specifications

- As an ITS Plant, Indian Point Proposed Tech Specs will meet the requirements of 10CFR 50.36 and the Commission Policy Statement on ITS.

- The currently proposed U3 TS place limits on fuel assembly cooling time, minimum and maximum average burnup, maximum initial enrichment, and decay heat.

- If STC water level/vapor gap, boron concentration, pressure, temperature or any other parameters are determined to be important process variables to ensure safety they will be added to the proposed TS.

# Technical Specifications

## Proposed Technical Specifications and Certificate of Compliance (CoC) type information

- According to ITS guidelines the content of the plant TS is limited.
- However, it is recognized that additional CoC type information should be added to the licensing basis. Options under consideration include:
  - addition of minimum Boron-10 loading in the neutron absorber panels to TS STC Design Features for Criticality.
  - additional LCOs and surveillances in accordance with 10CFR 50.36 to ensure operational limits are met prior to fuel transfer.
  - add LCOs to the Technical Requirements Manual for non 10CFR 50.36 variables
  - add STC and HI-TRAC descriptions to the UFSAR
- Establish with NRC concurrence which elements of the inter-unit fuel transfer operation and STC design meets the threshold for inclusion in the plant's TS.