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# Audit of Salem's use of WESTEMS Fatigue Software

On Yee

March 11, 2011

**United States Nuclear Regulatory Commission Official Hearing Exhibit**

<b>In the Matter of:</b> Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3)	
	<b>ASLBP #:</b> 07-858-03-LR-BD01
	<b>Docket #:</b> 05000247   05000286
	<b>Exhibit #:</b> NRC000119-00-BD01
	<b>Admitted:</b> 10/15/2012
	<b>Rejected:</b>
<b>Other:</b>	<b>Identified:</b> 10/15/2012
	<b>Withdrawn:</b>
	<b>Stricken:</b>



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# Identified Issues in New Reactors

- Two issues associated with WESTEMS performing NB-3600 calculations:
  - the use of the algebraic summation of three orthogonal vectors
  - methodology for stress combination related to thermal stresses
- Configuration control in WESTEMS - the ability of users to modify intermediate data (peak and valley stresses/times) used in the analyses



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# Impact to License Renewal

- Salem Nuclear Generating Station
  - RAI 4.3-07 issued November 22, 2010
    - Requested applicant to perform benchmark calculations for two locations (pressurizer surge nozzle and 1.5” BIT safety injection nozzle)
    - Discuss applicability of identified issues



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# Impact to License Renewal

- **Audit Objectives**
  - Review benchmark calculations to ensure WESTEMS provides results comparable to traditional NB-3200 analysis
  - Address the acceptability of analyst intervention in modifying intermediate WESTEMS data
  - Address the role of the WESTEMS NB-3600 module in license renewal calculations

# Audit Observations

- **January 18-19, 2011**
  - Documentation of analyst intervention was not available
  - Applicant verbally justified analyst intervention for the BIT nozzle
  - Confirmed that WESTEMS calculations that support the Salem LRA did not use the NB-3600 module
  - Confirmed that WESTEMS provides results that are reasonable and consistent with a traditional ASME Code Section III, NB-3200 analysis for the two locations
  - Applicant agreed to revise calculations to document results, for both locations, with and without analyst intervention
- **February 8, 2011**
  - Revised calculations for both locations documented the results with and without analyst intervention
  - Justifications for analyst intervention needs to be sufficiently specific

# Results from Audit

- Use of a software package to perform fatigue calculations should be consistent with ASME Code, Section III
- Analyst intervention should be justified and documented when using a software package to perform fatigue calculations
- WESTEMS NB-3600 module should not be used until identified issues are resolved
- The staff has reasonable assurance that Salem's use of the WESTEMS NB-3200 Design CUF module provides results that are consistent with a traditional ASME Code, Section III NB-3200 analysis
- Options are currently being considered on how to generically communicate the concerns and results of the audit