

July 19, 2007

ORGANIZATION: GE-Hitachi Nuclear Energy Americas, LLC (GHNEA)  
PROJECT: Economic Simplified Boiling Water Reactor (ESBWR) Design Certification  
SUBJECT: SUMMARY OF AUDIT FOR NUCLEAR DESIGN CODES  
OCTOBER /NOVEMBER 2006

The U.S. Nuclear Regulatory Commission (NRC) conducted an audit of General Electric Nuclear Energy (GE) and Global Nuclear Fuels (GNF) activities in Wilmington, NC from October 16 through October 19, 2006, and again from October 30 through November 3, 2006. During this audit, the NRC team conducted an evaluation of the documentation of GE codes related to nuclear design analyses. A list of attendees is provided in Enclosure 1 and a summary of the meeting including open items briefed during the audit exit are provided in Enclosure 2.

During continuing review of the ESBWR design certification, staff will be considering information gained during this audit and will communicate any additional issues or requests for information with the applicant on the ESBWR docket.

*/RA/*

Bruce M. Bovol, Project Manager  
ESBWR/ABWR Projects Branch 1  
Division of New Reactor Licensing  
Office of New Reactors

Docket No. 52-010

Enclosures:  
As stated

cc w/encls: See next page

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**Table 1: Audit Participation Summary**

Table 1 provides a comprehensive list of the audit participants from both NRC and GE. Their attendance at either the entrance meeting in Wilmington, NC or at the exit meeting (via teleconference from Washington, DC) has been noted.

<b>Last Name</b>	<b>First Name</b>	<b>Affiliation</b>	<b>Entrance Meeting</b>	<b>Exit Meeting (telecon)</b>
Barillas	Martha	NRC	x	x
Cabbage	Amy	NRC		x
Gilmer	James	NRC		x
Kaizer	Joshua	NRC		
Klein	Veronica	NRC	x	x
Landry	Ralph	NRC		x
Shuaibi	Mohammed	NRC		x
Yarsky	Peter	NRC	x	x
Anderson	Jens	GE		
Brown	Robert	GE		
Campbell	Patricia	GE		x
Fawks	James	GE		
Harrington	Roseanne	GE		
Heck	Charles	GE		
Mills	V. Webb	GE	x	
Moen	Stephan	GE	x	
Moore	Brian	GE	x	x
Mouney	Xavier	GE		
Stachowski	Russell	GE	x	
Trosman	Lukas	GE		
White	Frostie	GE	x	x

## **Nuclear Design Codes Audit Summary (October/November 2006)**

From October 16 through October 19, 2006, and October 30 through November 3, 2006, the Nuclear Regulatory Commission (NRC) conducted an audit of the General Electric Nuclear Energy (GE) and Global Nuclear Fuels (GNF) nuclear design codes to establish whether the ESBWR design applied codes preserved the NRC-approved methodologies. GE used the TGBLA06 and PANAC11 nuclear design codes to perform the analysis of record for the design certification of the ESBWR. These methods were initially evaluated in 1995, and approved generically under GESTAR in 1999. During the time between the initial evaluation in 1995, and the ESBWR design certification application, several revisions have been made to each code. The NRC team reviewed the design record files (DRFs) and software test reports (STRs) for both nuclear codes. The NRC team also conducted an evaluation of the internal GE processes for conducting code revisions. As part of the audit, the team reviewed the bases, models, qualification, and revision of the nuclear design methodologies and codes. The team performed a detailed review of the historical documentation of the codes, and found that there have been minor model changes to the codes.

Since the previous staff review of TGBLA06, three physical models have been changed in TGBLA06. The staff reviewed these changes and determined these changes do not constitute a change in the fundamental methodology. The team reviewed several documents related to the subsequent error corrections and revisions to the PANAC11A code after initial migration from the VAX to the Alpha VMS system. The team specifically reviewed certain items in these documents based on a list of error corrections provided to the NRC staff in response to ESBWR Design Certification RAI 4.3-4 (RAI Letter 53). The team reviewed the error correction revisions to PANAC11. The team found that the error correction revision process preserved the originally approved methodology.

The NRC team found that the nuclear design codes TGBLA06 and PANAC11 current revisions are still consistent with the methodology described in a letter to the NRC, "Implementation of Improved GE Steady State Nuclear Methods," dated July 2, 1996 (MFN 098-96), and approved in 1999 through the GESTAR II process. The NRC team reviewed GE documentation addressing the two open items identified in inspection report IR No. 99900003/95-01 and found the open items were adequately addressed and resolved. The NRC team and GE personnel conducted an exit meeting at the conclusion of the audit through teleconference where the NRC team communicated an open item that would be followed up through an RAI. Although the team found the codes remain consistent with the collection of models, solution technique, and implementation that forms the nuclear design methodology, the team identified an absence of periodic re-qualification of the codes following revisions against their original assessment basis. Therefore, the team requested a cycle re-analysis in RAI 4.3-4 of a specific cycle that formed the initial qualification database to confirm the methodology has been preserved. Staff addressed RAI 4.3-4 S02 (ML070780030) which was sent to GE requesting additional information on March 14, 2007. The team identified another open item related to isotopic tracking and requested GE address the item in RAI 21.6-86 and RAI 21.6-94. As of June 15, 2007, RAI 21.6-86 indicates resolved while RAI 21.6-94 remains open with an action item for GE to add a COL applicant action item. This action item is for the applicant to inform NMSS of their accounting methodology which is required to fulfil 10 CFR 74 requirements.