April 19, 2005

ORGANIZATION: General Electric Nuclear Energy (GE)

PROJECT: Economic and Simplified Boiling Water Reactor (ESBWR) Pre-application Review

SUBJECT: SUMMARY OF MEETING HELD ON MARCH 9, 2005, TO DISCUSS ISSUES RELATED TO THE PIPING ANALYSIS FOR GE'S PLANNED APPLICATION FOR DESIGN CERTIFICATION OF THE ESBWR

The Nuclear Regulatory Commission (NRC) hosted a public meeting with General Electric Nuclear Energy (GE) on March 9, 2005, at NRC Headquarters to discuss issues related to the piping analysis for GE's planned application for design certification of the ESBWR. A list of attendees is provided as Enclosure 1. Enclosure 2 contains the agenda for the meeting.

GE provided handouts during the meeting which can be accessed through the Agencywide Documents Access and Management System (ADAMS). This system provides text and image files of NRC's publicly available documents. The handouts mentioned above may be accessed through the ADAMS system under Accession Nos. ML050770285 and ML050770286. If you do not have access to ADAMS or if there are problems in accessing the handouts located in ADAMS, contact the NRC Public Document Room (PDR) Reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr@nrc.gov. A summary of the meeting is included below.

The purpose of the meeting was to discuss the proposed method for ESBWR piping analysis and the proposed use of design acceptance criteria (DAC) at the design certification stage. GE provided an overview of the ESBWR design and discussed the similarities and differences between the ESBWR and GE's advanced boiling water reactor (ABWR) design which has been certified by the NRC. The two major differences between the ESBWR and ABWR are that the ESBWR uses natural circulation versus forced circulation, and that the ESBWR has passive safety systems versus active safety systems. Also, as a result of the utilization of passive safety systems, the ESBWR reactor building service water, plant service water, and diesel generators are non-safety grade. The ESBWR reactor vessel is the same diameter as the ABWR vessel, however the ESBWR vessel is taller to enhance natural circulation flow.

The ESBWR passive safety systems include the passive containment cooling system (PCCS), the gravity driven cooling system (GDCS), and the isolation condenser system (ICS). In addition, the ESBWR has the following "defense-in-depth" systems to provide backup inventory control: the motor driven feedwater pumps; the control rod drive (CRD) system pumps; the low pressure coolant injection via the fuel and auxiliary pools cooling system (FAPCS); the fire protection system; and the capability for an externally connected water source. To provide backup decay heat removal in the ESBWR, the following systems are available: the main condenser; the shutdown cooling system; the suppression pool cooling; and the fire protection system.

GE discussed the approach for the ABWR design certification, stating that no thermal or dynamic piping analysis was submitted for review during the ABWR design certification and that the review focused on acceptance of methods to be used and GE's commitment to follow established industry standards. The staff provided clarification, stating that during the ABWR certification review, the NRC performed audits of analyses of the Kashiwazaki-Kariwa (K6 and K7) ABWR units which were constructed in Japan. The staff also referred to SECY-92-053, "Use of Design Acceptance Criteria During 10 CFR Part 52 Design Certification Reviews," dated February 19, 1992, which states that "the staff expects to perform detailed reviews of representative sample analyses that will form the basis for approving the applicant's design methodology," and SECY-92-196, "Development of Design Acceptance Criteria (DAC) for the Advanced Boiling Water Reactor (ABWR)," dated May 28, 1992, which states that the application "will include, as appropriate, sample calculations or other supporting information to illustrate methods that are acceptable to the staff," and that "much of the staff's safety evaluation report (SER) is based on the staff's audit of the main steam, feedwater, and the safety relief valve discharge piping analysis."

GE presented their proposed approach for the ESBWR design certification which is to perform thermal stress analysis on lines of safety significance using stress ratio and fatigue usage criteria, and to use DAC for other piping. GE also presented their proposed piping selection analysis criteria which would be used to determine which piping should be analyzed as part of the design certification. As a result of the piping selection determination, GE has selected the iodine cleanup system (ICS) line from the reactor pressure vessel (RPV) to the condenser, the reactor water cleanup/shutdown cooling line, the feedwater lines, and the main steam lines including the safety relief valve discharge lines for the American Society of Mechanical Engineers (ASME) Code thermal analysis in support the ESBWR design certification. GE will also perform an erosion/corrosion evaluation of the feedwater and main steam piping and will generate seismic and hydrodynamic load spectra prior to submission of the design certification application.

GE has proposed that dynamic analysis would not be included in the design certification. GE stated that the pipe routing can be established based on the thermal stress analysis with confidence that the final design would meet the DAC when the detailed design is completed. This conclusion is based, in part, on GE's recent experience with the detailed design of the Lungmen ABWR which is under construction in Taiwan.

The staff questioned why GE did not want to perform the dynamic piping analysis at this time. GE stated it is a very large program to run compared to the thermal analysis and that the dynamic analysis would have to be redone at the combined license phase to account for site-specific seismic spectra and possible plant specific design changes. The staff expressed concerns regarding the ability to place necessary piping supports after the dynamic analysis is completed. GE indicated that supports may be awkward but they could be designed. The staff indicated that they would like to see an example dynamic analysis during the design certification, and that the main steam and feedwater lines would be a good example due to the complexity of the analysis.

In conclusion, the staff recommended that GE formally request the use of piping DAC for ESBWR, and continue to prepare their application based on their proposed approach, with the recognition that the approval of piping DAC is subject to staff review and would require Commission approval. If piping DAC is not approved, additional piping analyses would have to be performed by GE in support of the design certification and would likely extend the schedule for the design certification review. If piping DAC is approved, additional sample analysis would likely be requested by the staff to support the design certification.

/RA/

Amy E. Cubbage, ESBWR Project Manager
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Office of Nuclear Reactor Regulation

Project No. 717

Enclosures: As stated

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ML050770285 and ML050770286-Handouts
ML051040322-Meeting Summary
ADAMS ACCESSION NUMBER: ML051040321-Pkg.

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DATE	4/14/2005	4/18/2005	4/19/2005

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MEETING WITH GENERAL ELECTRIC
ESBWR PRE-APPLICATION REVIEW
MARCH 9, 2004

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James Han	NRC/RES/DSARE
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Enclosure 1

Agenda for Public Meeting Regarding ESBWR Preapplication Review
Topic - Piping Analysis
March 9, 2005, 9:00 a.m. to 4:00 p.m., Room O7B4

9:00 a.m. - 9:10 a.m.	Introductory Remarks	A. Cubbage, NRR R. Gamble, GE
9:10 a.m. - 10:00 a.m.	ESBWR Project Overview	R. Gamble, GE
10:00 a.m. - 11:30 a.m.	Mechanical Safety or High Energy Systems & Piping Discussion - Control Rod Drive System - Passive Containment Cooling System - Gravity Driven Cooling System - Isolation Condenser System - Reactor Water Cleanup/Shutdown Cooling System - Nuclear Boiler System (Main Steam & Feedwater)	G. Deaver, GE
11:30 p.m. - 12:00 a.m.	Comparison of ESBWR and ABWR Containment Designs & Loadings	G. Deaver, GE
12:00 p.m. - 1:00 p.m.	Lunch	
1:00 p.m. - 1:30 p.m.	Selection Criteria for Pipes to be Analyzed for Design Control Document (DCD)	G. Deaver, GE
1:30 p.m. - 2:00 p.m.	Load Combination & Stress Criteria for Class 1 Piping Analysis	G. Deaver, GE
2:00 p.m. - 3:00 p.m.	Piping Analysis to be Performed for DCD and Combined License (COL)	G. Deaver, GE
3:00 p.m. - 3:30 p.m.	Piping Related Information to be Provided in the ESBWR DCD	G. Deaver, GE
3:30 p.m. - 3:50 p.m.	Discussion	NRC/GE
3:50 p.m. - 4:00 p.m.	Opportunity for Public Comment	All
4:00 p.m.	Adjourn	

Enclosure 2

cc:

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