From: Shea, James
Sent: Tuesday, April 20, 2021 9:59 AM
To: GEH-BWRX-300RAIsPEm Resource
Subject: BWRX-300 Request for Additional Information (Public) Letter No. 14 LTR NEDC-33922P, Containment Evaluation Method (eRAI 9817, 9826, 9829, & 9831)
Attachments: GEH BWRX-300 Request for Additional Information Letter No. 14 Containment Evaluation Method LTR Non-Prop Version.docx

James Shea
NRR/DNRL/NRLB
BWRX-300 PM

Hearing Identifier: GEH_BWRX300_RAIs_Public
Email Number: 16

Mail Envelope Properties (DM8PR09MB6901DED7B7B49EDA3203D62F94489)

Subject: BWRX-300 Request for Additional Information (Public) Letter No. 14 LTR NEDC-33922P, Containment Evaluation Method (eRAI 9817, 9826, 9829, & 9831)
Sent Date: 4/20/2021 9:58:57 AM
Received Date: 4/20/2021 9:59:00 AM
From: Shea, James

Created By: James.Shea@nrc.gov

Recipients:
"GEH-BWRX-300RAIsPEm Resource" <GEH-BWRX-300RAIsPEm.Resource@nrc.gov>
Tracking Status: None

Post Office: DM8PR09MB6901.namprd09.prod.outlook.com

Files	**Size**	**Date & Time**
MESSAGE	60	4/20/2021 9:59:00 AM
GEH BWRX-300 Request for Additional Information Letter No. 14 Containment Evaluation Method LTR Non-Prop Version.docx	24671	

Options
Priority: Normal
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:

Request for Additional Information Letter No. 14 (eRAI 9817, 9826, 9829, & 9831)
Issue Date: 04/08/2021
Application Title: GEH BWRX-300 Pre-Application Licensing Topical Reports (LTRs)
GEH BWRX-300 LTR NEDC-33922P, Containment Evaluation Method
Operating Company: GE Hitachi Nuclear Energy (Wilmington, NC)
Docket No. 99900003

QUESTIONS:

SRP-Review Section: 06.02.01 - Containment Functional Design Application Section:

06.02.01-01 (eRAI 9817)

Requirement

General Design Criterion 50 – Containment design basis, requires the reactor containment structure, including access openings, penetrations, and the containment heat removal system be designed so that the containment structure and its internal compartments can accommodate, without exceeding the design leakage rate and with sufficient margin, the calculated pressure and temperature conditions resulting from any loss-of-coolant accident (LOCA).

Issue

In order to determine the conservative mass and energy discharge to the containment, a computer code and the associated evaluation model needs to have the capability to model relevant physical phenomenon during a LOCA with a conservative treatment of uncertainties. Standard Review Plan (NUREG-0800) Section 6.2.1.3, "Mass and Energy Release Analysis for Postulated Loss-of-Coolant Accidents (LOCAs)," notes that "calculations of the mass and energy release rates for a LOCA should be performed in a manner that conservatively establishes the containment internal design pressure (i.e., maximizes the post-accident containment pressure and the containment subcompartment response)."

GEH states in Section 5.2.4 of licensing topical report "BWRX-300 Containment Evaluation Method (NEDC-33922P, Revision 0)," that the only non-condensable gases that may migrate into the isolation condenser system (ICS) tube bundles are the radiolysis products following a design basis LOCA. This is based on the design not experiencing any significant fuel cladding oxidation during a LOCA.

However, based on the BWRX-300 ICS design, [1][[…..]].

Request

Therefore, the staff is requesting additional information regarding [[…..]] the associated modeling uncertainties, and the subsequent consequences for both large break and small break LOCA limiting cases.

[1] **[[…..]] –** GEH Proprietary Information based on LTR submittal and GEH Confirmation dated 4/8/21

06.02.01-02 (eRAI 9831)

BWRX-300 Containment External Surface Thermal Boundary Condition & Shell Modeling

Requirement

Guided by the Standard Review Plan (SRP) Section 6.2.1 and the General Design Criteria (GDCs) 16, 38, and 50 of Appendix A to 10 CFR Part 50 relevant to the containment design basis, the staff is reviewing the applicant's analytical model and assumptions used in the GEH LTR NEDC-33922P, Revision 0, BWRX-300 Containment Evaluation Method. The staff needs to assess the conservatism of the presented model, constitutive/closure relations, model input parameters, and initial/boundary conditions used for the design basis event (DBE) containment response analyses, in order to determine whether the methodology would be acceptably conservative over the applicable range of DBE conditions.

Issue

LTR NEDC-33922P, Section 2.0 states that [[….]]. However, the LTR does not describe the thermal boundary condition assumed for the containment outer surface, except for the PCCS pipes and the containment dome. The LTR is also not clear about whether [[…..]] is intended to be a standard assumption within the proposed containment evaluation (CE) methodology, or it is just a convenient assumption made for the LTR demonstration analyses. As containment external surface thermal boundary condition and [[…..]] are key assumptions in meeting several acceptance criteria identified in Section 1.3 of the LTR, the NRC staff would consider them as part of their safety finding about the conservatism.

Request

Therefore, the staff requests a detailed description of the containment outer surface thermal boundary condition as well as [[…..]] assumed as a part of the CE methodology. The applicant is also requested to update the LTR, accordingly.

SRP-Review Section: 06.02.01.03 - Mass and Energy Release Analysis for Postulated Loss-of-Coolant Accidents (LOCAs) Application Section:

06.02.01.03-01 (eRAI 9826)

Requirement

General Design Criterion 50 – Containment design basis, requires the reactor containment structure, including access openings, penetrations, and the containment heat removal system be designed so that the containment structure and its internal compartments can accommodate, without exceeding the design leakage rate and with sufficient margin, the calculated pressure and temperature conditions resulting from any loss-of-coolant accident.

Standard Review Plan (NUREG-0800) Section 6.2.1.3, "Mass and Energy Release Analysis for Postulated Loss-of-Coolant Accidents (LOCAs)," identifies 10 CFR Part 50 Appendix K, "ECCS Evaluation Models," as providing the appropriate analysis assumptions and requirements related to sources of energy during the LOCA. SRP 6.2.1.3 further states that calculations of the energy available for release "should be done in general accordance with the requirements of 10 CFR Part 50, Appendix K, paragraph I.A" and that additional conservatism should be included to maximize the energy release to the containment.

Issue

In this licensing topical report, "BWRX-300 Containment Evaluation Method (NEDC-33922P, Revision 0)," GEH developed a [[…..]] considering the specific BWRX-300 dry containment design features.

In contrast to the ESBWR, the BWRX-300 [[…..]]. Therefore, the staff is requesting additional information from GEH to justify the overall conservatism of the proposed BWRX-300 mass and energy evaluation model.

Request

In particular, additional justification is needed for the following aspects:

1. Isolation Condenser Performance due to accumulating non-condensable radiolytic gas;
2. Core decay heat model using ANS 1979 standard with 2 sigma uncertainty instead of ANS 1971 standard with 1.2 multiplier following the requirement of Appendix K to 10 CFR Part 50;
3. [[…..]];
4. [[…..]];
5. [[…..]];
6. [[…..]];
7. [[…..]].

SRP-Review Section: 06.02.04 - Containment Isolation System Application Section: 1.3

06.02.04-01 (eRAI 9829)

Requirement

General Design Criterion 50 – Containment design basis, requires the reactor containment structure, including access openings, penetrations, and the containment heat removal system be designed so that the containment structure and its internal compartments can accommodate, without exceeding the design leakage rate and with sufficient margin, the calculated pressure and temperature conditions resulting from any loss-of-coolant accident.

Issue

LTR NEDC-33922P, Section 1.3, “Acceptance Criteria,” states in one of the criteria that “containment remains isolated for 72 hours during a design basis event or accident.” The staff found that this statement might not be valid in some accidents such as isolation condenser system LOCA outside containment. It is understood that the subjects of containment isolation and pipe failures outside containment are not in the scope of this LTR.

Request

The applicant is requested to clarify the statement by specifying the applicability of the statement within the LTR and applicable conditions.