

**U.S. NUCLEAR REGULATORY COMMISSION SUMMARY OF THE NOVEMBER 17, 2022,
OBSERVATION PUBLIC MEETING TO DISCUSS PRE-APPLICATION LICENSING WHITE
PAPER AND TOPICAL REPORT ON STEEL-PLATE COMPOSITE STRUCTURAL DESIGN
FOR THE BWRX-300 SMALL MODULAR REACTOR**

Meeting Summary

On November 17, 2022, an Observation Public Meeting was held between the U.S. Nuclear Regulatory Commission (NRC) staff, Canadian Nuclear Safety Commission (CNSC) staff, GE-Hitachi Nuclear Energy Americas, LLC (GEH), and other stakeholders as identified in Enclosure 2. The purpose of this public meeting was to discuss the submitted White Paper on BWRX-300, “Steel-Plate Composite Structural Design” (ML22287A177) and for the NRC and CNSC staff to give feedback. The White Paper was submitted to the NRC and CNSC on October 14, 2022.

The topics discussed during this meeting included the following:

- Description of the integrated reactor building and its structures
- General overview of steel-plate composite materials.
- Technical evaluation of the proposed use of steel-plate composite materials.
- Technical evaluation of the proposed codes and standards applicable to the proposed use of steel-plate composite materials.
- Regulatory evaluation used to address both CNSC and NRC regulatory requirements including proposed content for a future licensing topical report

The meeting commenced at 10:00 a.m. with the NRC staff opening remarks, as well as introductions by the participants. After the introductions, GEH used the “White Paper,” submitted to the NRC and CNSC as an overview of its planned LTR, “BWRX-300 Steel-Plate (SC) Containment Vessel (SCCV) and Reactor Building Structural Design (NEDC-33926P)” expected to be submitted for staff review in 2023.

Both NRC and CNSC staff participated in the meeting. The presentation began with a general description of the BWRX-300, including description of the integrated Reactor Building (RB) consisting of the Steel-Plate Composite Containment Vessel (SCCV), containment internal structures, and the RB structure. GEH then turned to the discussion of the technical evaluation of the proposed use of steel-plate composite materials for the integrated reactor building, the proposed codes and standards, and the progress of the Department of Energy (DOE) sponsored National Reactor Innovation Center (NRIC) Demonstration Program led by Idaho National labs (INL). Lastly, the presentation covered the regulatory requirements of both the CNSC and NRC to be addressed in a future licensing topical report.

CNSC and NRC staff made comments and asked several clarifying questions in addition to providing constructive feedback to GEH on their proposed approach. There were no questions or concerns from the public. The presentation from GEH did not contain any proprietary

information so a closed portion of this meeting was not necessary. As a result, the meeting was adjourned at 11:45 am.

As a result of this public meeting and the resulting meeting summary feedback (below), the NRC considers this White Paper closed.

Staff feedback and Comments on the “White Paper”

NRC/ CNSC Staff provided the following feedback to GEH regarding the details and design information expected in the proposed LTR regarding Containment and Reactor Building Structural Design (NEDC-33926P) for review.

- Integrated RB Design Details

NRC staff inquired if the proposed Containment and Reactor Building Structural Design LTR would include details on the RB steel plate composite (SC) basemat thickness, typical steel-SC materials dimensions, material specification, and dissimilar metal interactions on the inner side of the SC spent fuel pool (SFP) structure, including the details of the process for connecting stainless steel to carbon steel. Staff also asked about the waterproofing and any special considerations for corrosion of the embedded RB SC structure including basemat, the Steel-Plate Composite Containment Vessel (SCCV) design pressure and temperature limits, testing for design-basis accident (DBA) conditions, beyond design-basis accident conditions, vertical and horizontal SC members testing, concrete void testing, structure interactions with other buildings, seismic analysis, and modeling. GEH stated that the special considerations for the SCCV and RB steel-plate composite materials are being developed and that the details of these design details would be provided in the planned LTR to the extent that the design has been developed. In terms of timelines, it was clarified by GEH that the NRIC schedule provided in the white paper is no longer up to date as there is a delay in testing and they are working on updating the testing schedule.

It was confirmed that effects of aging and wear will be considered by GEH (CNSC requirement). GEH also pointed out that the process details for connecting the stainless-steel liner to the structural carbon steel (ASTM A572 Gr 50) face on the inner side of the SFP structure is being developed. GEH stated that the main purpose of the proposed LTR is to provide the approach and technical bases for meeting applicable regulatory requirements for the design of the integrated RB and SCCV using steel-plate composite materials technology including the testing program that will validate the design and safety margins. GEH stated that the LTR would include the details from phase 1 of the NRIC demonstration program. In response to additional questions from the staff regarding the testing in accident conditions and thermal loading, GEH pointed to the NRIC program prototype testing of critical SC structural components planned at Purdue University, to establish DB and BDB structural performance including thermal loading in support of Seismic Category 1 structures and containment for the BWRX-300. GEH also confirmed from staff questions that the integrated RB and containment structures would use single integrated finite element model in its seismic evaluations. During the meeting GEH confirmed that the containment for the BWRX-300 will be designed with a dry nitrogen inerted containment.

- Applicable NRC Regulations and Regulatory Guides

The NRC staff questioned the applicable NRC Regulations and regulatory guidance including regulatory guides (RGs) that would be referenced in the planned LTR for the integrated RB, the SCCV and other internal structures. Staff made some references to expected Regulations and RGs that could apply to the design and licensing of the BWRX-300 using the steel-plate composite construction including 10 CFR 50.55a, “Codes and Standards,” 10 CFR 50.34(f)(3)(v), 10 CFR 50.55a(g)(4), 10 CFR 50.44, 10 CFR 50.65, Appendix A to Part 50 General Design Criteria for Nuclear Power Plants (GDCs), including GDC 1, “Quality Standards and Records,” GDC 2, “Design Bases for Protection Against

Natural Phenomena,” GDC 4, “Environmental and dynamic effects design bases,” GDC 16, “Containment Design,” GDC 51, “Fracture Prevention of Reactor Coolant Pressure Boundary, GDC 50, “Containment Design Basis, and GDC 53 “Provisions for containment testing and inspection,” 10 CFR 50 Appendix B, 10 CFR 50 Appendix J, and 10 CFR 50.150 “Aircraft Impact Assessment.” NRC guidance including “NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants” (SRP) Chapter 3, ” Design of Structures, Components, Equipment, and Systems,” SRP Sections 3.7.1, 3.7.2, 3.7.3, 3.8.1, 3.8.2, “ Steel Containments,” SRP Section 3.8.3, “Concrete and Steel Internal Structures of Steel or Concrete Containments,” 3.8.4, 3.8.5, SRP Chapter 19, “Severe Accidents,” SRP Section 19.0, “Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors,” SRP Section 19.3, “Regulatory Treatment of Non-Safety Systems (RTNSS) for Passive Advanced Light Water Reactors,” and SRP Section 19.5, “Aircraft Impact.” NRC RGs that could apply to aspects of integrated RB include RG 1.28, “Quality Assurance Program Criteria (Design and Construction),” RG 1.29, “Seismic Design Classification for Nuclear Power Plants,” RG 1.61, “Damping Values For Seismic Design Of Nuclear Power Plants,” RG 1.7, “Control of Combustible Gas Concentrations in Containment,” RG 1.76, “Design-Basis Tornado and Tornado Missiles for Nuclear Power Plants,” RG 1.84, “Design, Fabrication, and Materials Code Case Acceptability, ASME Section III,” RG 117 “Protection Against Extreme Wind Events and Missiles for Nuclear Power Plants,” RG 1.216, “Containment Structural Integrity Evaluation for Internal Pressure Loadings Above Design-Basis Pressure,” and RG 1.217, “Guidance for the Assessment of Beyond-Design-Basis Aircraft Impacts,” RG 1.231, “Acceptance of Commercial Grade Design and Analysis Computer Programs used in Safety-Related Applications for Nuclear Power Plants,” and RG 1.243, “Safety Related Steel Structures and Steel-plate Composite Walls for Other than Reactor Vessels and Containments.” Other NRC staff guidance includes DC/COL-ISG-020, “Interim Staff Guidance on Implementation of a Probabilistic Risk Assessment-Based Seismic Margin Analysis for New Reactors, and Commission Policy Statement, NRC-2008-0237, “Policy Statement on the Regulation of Advanced Reactors.”

- Applicable Industry Codes and Standards

The applicant is planning to reference ASME SC III, Division 2, for the containment design and AISC N690, with deviations specifically tailored for use of steel-plate composite materials for the integrated RB and the SCCV. Although GEH did not mention the Inservice Inspection (ISI) requirements for operating conditions GEH is expected to reference ASME Code Section XI, and the applicability of this code for use with the steel-plate composite materials for SCCV containment design. Further, during the discussions, the staff pointed out that the applicant in this case cannot request a proposed alternative to codes and standards requirements pursuant to 50.55a(z) as suggested in its white paper, because 50.55a(z) applies to requirements in codes and standards that are incorporated by reference and mandated in 50.55a and included in a current licensing basis of a plant. Therefore, only a current licensee can apply 10 CFR 50.55a(z) and GEH does not have a license for BWRX-300. In addition, ASME Section III, Division 2, and other codes and standard proposed to be used in the LTR are not incorporated by reference nor mandated by 10 CFR 50.55a, and therefore 50.55a(z) cannot be applied to these codes; hence, again GEH cannot request NRC authorization pursuant to 50.55a(z).

GEH acknowledged this issue during the meeting and will provide the proper regulatory bases used for the design and how they are met.