# Joint Report on GEH BWRX-300 Steel-Plate Composite (SC) Containment Vessel (SCCV) and Reactor Building Structural Design White Paper

*A Collaborative Review by the U.S. Nuclear Regulatory Commission and the Canadian Nuclear Safety Commission*

**June 2023**

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## Preface

On August 15, 2019, the Canadian Nuclear Safety Commission (CNSC) and the United States (U.S.) Nuclear Regulatory Commission (NRC) signed a joint memorandum of cooperation (MOC) [1] aimed at enhancing technical reviews of advanced reactor and small modular reactor (SMR) technologies. This MOC is intended to supplement and strengthen the existing memorandum of understanding (MOU) between the two parties signed in August 2017 [2]. Additional information on international agreements and the CNSC can be found at https://nuclearsafety.gc.ca/eng/resources/international-cooperation/international-agreements.cfm.

Cooperation between the CNSC and the USNRC provides opportunities for both agencies to share scientific information about technical matters that could support more efficient reviews of SMR and advanced reactor technologies. Cooperative activities can be conducted, while acknowledging differences between the Canadian and U.S. regulatory frameworks and licensing processes, by leveraging fundamental scientific and engineering findings from other reviews to the extent practicable.

Activities under the MOC are coordinated by a subcommittee of the CNSC-USNRC Steering Committee, called the Advanced Reactor Technologies and SMRs subcommittee. The subcommittee approves and prioritizes work plans to accomplish specific cooperative activities under the MOC [3].

Cooperative activities between both organizations are established and governed under Terms of Reference (see https://nuclearsafety.gc.ca/eng/resources/international-cooperation/international-agreements/cnsc-usnrc-smr-advanced-reactor-moc-tor.cfm) and are designed to do the following:

- Contribute to better use of the regulators' resources by leveraging the technical knowledge and capabilities between the USNRC and the CNSC.
- Enhance the depth and breadth of the respective CNSC and USNRC staffs' understanding of the counterpart Nation's regulatory review activities and requirements.
- Enhance the joint opportunities for learning about and understanding the advanced reactor and SMR technologies being reviewed.

The decision of the CNSC and the USNRC to cooperate in activities that concern specific reactors and their associated vendors depends on the state of the design. It is based on the following factors that the vendor or applicant must address in a proposed work plan that both regulators accept:

- The extent the vendor or applicant is engaging in meaningful licensing or pre-licensing activity with each regulator.
- The similarities between the vendor's engagement activities in each country in order to achieve a useful cooperation outcome. For example, the objectives of the CNSC's

vendor design review process differ from those of the U.S. certification and engagement processes, yet opportunities exist for leveraging information between the two regulators.

- The timelines for engaging with each regulator.

- The way the vendor is sharing information about its design with both regulators to enable cooperation.

These joint products are envisioned to enhance advanced reactor design reviews and support regulatory reviews by each regulator, as appropriate.

# Executive Summary

This report documents the results of collaborative activities between the Canadian Nuclear Safety Commission (CNSC) and the United States (U.S.) Nuclear Regulatory Commission (USNRC) concerning a request by GE-Hitachi Nuclear Energy Americas LLC (GEH), to obtain feedback on its Steel-Plate Composite (SC) Containment Vessel (SCCV) and Reactor Building (RB) Structural Design White Paper for the BWRX-300 submitted to the NRC and CNSC on October 14, 2022 (NRC Agencywide Documents Access and Management System Accession No. ML22287A176, CNSC e-doc # 6891712) [4]. The results of this report may be used by the vendor or a potential licensee in future discussions with either regulator, but they are not legally binding on the CNSC or the USNRC.

The CNSC and the USNRC have reviewed the white paper and concluded that GEH's proposed approach for the design of BWRX-300 SCCV and RB is reasonable to demonstrate the acceptability of the licensing approach and to prepare for additional submittals regarding the BWRX-300 Small Modular Reactor design and licensing basis related to SC. GEH recognizes the proposed design is not covered in its entirety by the existing design codes, and has an appropriate plan to bridge those gaps.

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## List of Acronyms

| | |
|---|---|
| ADAMS | Agencywide Documents Access and Management System |
| AISC | American Institute of Steel Construction |
| ANSI | American National Standards Institute |
| ASME | American Society of Mechanical Engineers |
| B&PV | boiler and pressure vessel |
| BWR | boiling-water reactor |
| CFR | *Code of Federal Regulations* |
| CNSC | Canadian Nuclear Safety Commission |
| CPA | construction permit application |
| CSA | Canadian Standards Association |
| DBE | design-basis earthquake |
| GDC | General Design Criteria |
| GEH | GE-Hitachi Nuclear Energy Americas LLC |
| IP | In-Plane |
| LTC | License to Construct |
| LTR | licensing topical report |
| MOC | memorandum of cooperation |
| MOU | memorandum of understanding |
| NPP | nuclear power plant |
| NRC | Nuclear Regulatory Commission |
| NRIC | National Reactor Innovation Center |
| OOP | Out-Of-Plane |
| OPG | Ontario Power Generation |
| RB | reactor building |
| REGDOC | Regulatory Document |
| RG | regulatory guide |
| RPV | reactor pressure vessel |
| SC | Steel-plate composite |
| SCCV | Steel-Plate Composite Containment Vessel |
| SEI | Structural Engineering Institute |
| SSC | structure, system, and component |
| TVA | Tennessee Valley Authority |
| US | United States |
| VDR | vendor design review |

## 1. Introduction

This report documents the results of collaborative activities between the Canadian Nuclear Safety Commission (CNSC) and the United States (US) Nuclear Regulatory Commission (NRC) concerning a request by GE-Hitachi Nuclear Energy Americas LLC (GEH), to obtain feedback on its Steel-Plate Composite (SC) Containment Vessel (SCCV) and Reactor Building (RB) Structural Design White Paper for the BWRX-300 submitted to the NRC and CNSC on October 14, 2022 (NRC Agencywide Documents Access and Management System (ADAMS) Accession No. ML22287A176, CNSC e-doc # 6891712) [4]. The results of this report may be used by the vendor or a potential licensee in future discussions with either regulator, but they are not legally binding on the CNSC or the USNRC.

In April 2022, the Tennessee Valley Authority (TVA) and Ontario Power Generation (OPG) announced plans to jointly work to help develop and deploy small modular reactors (SMRs) in both Canada and the US. They have signed a memorandum of understanding (MOU) that allows the companies to coordinate efforts on the design, licensing, construction, and operation of SMRs. CNSC and USNRC are currently engaged in licensing and pre-application activities with OPG and TVA, respectively, in preparation to build BWRX-300 reactor in Canada and the US. In September of 2022, CNSC and USNRC signed a Charter [15] establishing a collaborative relationship on the BWRX-300 SMR design project. Under this charter, OPG, TVA and GEH will identify licensing topics for consideration by the CNSC and USNRC for cooperative reviews. Further, OPG, TVA, and GEH will identify challenges with applying existing guidance or frameworks, provide technical information to facilitate timely and efficient safety reviews, and ensure efficient communication with both regulators.

Nothing in this report fetters the powers, duties or discretion of CNSC or NRC designated officers, CNSC or NRC inspectors or the respective Commissions regarding making regulatory decisions or taking regulatory action. Nothing in this report is to be construed or interpreted as affecting the jurisdiction and discretion of the CNSC in any assessment of any application for licensing purposes under the Nuclear Safety and Control Act of January 2017 [5], its associated regulations or the CNSC Rules of Procedure. Likewise, nothing in this report is to be construed or interpreted as affecting the jurisdiction and discretion of the NRC in any evaluation of any application for licensing purposes under the Atomic Energy Act of 1954, as amended, its associated regulations and the NRC Management Directives. This report does not involve the issuance of a license under Section 24 of the Nuclear Safety and Control Act (Canada) or under Section 103 of the Atomic Energy Act of 1954 (USA). The conclusions in this collaborative report are of the CNSC and NRC staff.

### 1.1. GEH Engagement with the USNRC

In September 2019, GEH initiated pre-application activities with the NRC on its BWRX-300 reactor design to support a future license application. The BWRX-300 is a ~300 MWe light-water-cooled, natural circulation SMR with passive safety systems. The design of the BWRX-300 is based in part on the U.S. NRC-certified 1,520 MWe Economic Simplified Boiling-Water Reactor. GEH has submitted five licensing topical reports (LTRs) on key licensing issues since 2020 that have been reviewed and approved by the NRC staff. LTRs describe the BWRX-300 design approaches and analyses methodologies for the BWRX-300 SMR in advance of a future in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of

Production and Utilization Facilities," or Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants." GEH has also submitted two white papers in 2022 as part of pre-LTR submittal engagements, including one on containment and RB Structural Design, which is the subject of this report. On May 4, 2023, GEH submitted an LTR on this same subject, but discussion of this LTR is beyond the scope of this report. GEH plans to submit an additional 2 LTRs in 2023.

### 1.2. GEH Engagement with the CNSC

GEH and the CNSC entered a combined optional pre-licensing Phase 1 and 2 Vendor Design Review (VDR) in December 2019 through a service agreement. The VDR determined whether GEH understands CNSC regulatory requirements and to what extent the reactor design meets those requirements. The VDR took place during the design process while the design is still evolving to provide early feedback. This allows for early identification and resolution of potential regulatory or technical issues in the safety analysis and design process, particularly those that could result in significant changes to the design.

The BWRX-300 VDR concluded that GEH understands and correctly interpreted the intent of Canadian regulatory requirements for the design of nuclear power plant (NPPs). However, the review did reveal some technical areas for development to better demonstrate adherence to CNSC requirements.

## 2. Scope and Objectives for the Cooperative Activity

The work plan [3] issued in September 2022, describes the scope of work and objectives as follows:

> *"To share regulatory experiences and insights for the BWRX-300 SMR design. Specifically, the scope of work is to perform a collaborative review of a white paper on BWRX‑300 Containment and Reactor Building Structural Design (Advance Construction Technique using Steel Bricks). An exchange of information between the CNSC and USNRC will cover safety review methodologies, regulatory approaches, and treatment of unique aspects of the BWRX-300 Advance Construction Technique."*

The main objective of this report is to document the USNRC and the CNSC staff's joint assessment of the BWRX-300 SC SCCV and RB Structural Design White Paper [4].

## 3. Regulatory Framework

### 3.1. CNSC

GEH is the design authority for the BWRX-300 OPG's License To Construct (LTC) Application, submitted to the CNSC in October 2022. The LTC application includes use of SC for the RB and containment structures.

The CNSC generally adopts a risk-informed, performance-based regulatory approach; therefore, it does not prescribe specific codes and standards for the design and manufacturing of systems, structures, and components (SSCs). However, it requires that the quality of SSCs be commensurate with their safety classification for design, construction, and maintenance.

CNSC requirements and guidance are documented in regulatory documents (REGDOCs) and standards. Those most relevant to containment and RB structures (i.e., the structures where SC is to be used in GEH design) are presented below:

<u>CNSC Regulatory documents</u>

CNSC REGDOC-1.1.2, "Licence Application Guide: Guide to Construct A Reactor Facility" [17]

This document outlines the requirements and expectations for a license application to construct a reactor facility. It contains specific information requirements and expectations for civil structures (that includes RB part of SC) and for pressure boundary (containment part of SC structure).

CNSC REGDOC-2.5.2, "Design of Reactor Facilities: Nuclear Power Plants" [6]

This document outlines the requirements and expectations for the design of reactor facilities, including, but not limited to requirements for: identification of codes and standards, identification of hazards (natural and man-made), design-basis and design extension conditions, initiating events, seismic and environmental qualification, containment requirements, overpressure protection etc.

CNSC REGDOC-2.6.3, "Fitness for Service Aging Management" [18]

This document outlines the requirements for aging management of structures, systems and components of NPPs. It requires that aging management be considered during the design phase.

<u>Canadian design standards</u>

CSA N287 series [7] of standards provides requirements for concrete containment structures and some of its requirements would be applicable to the SCCV.

CSA N291, "Requirements for nuclear safety-related structures," provides the design requirements for safety-related structures, other than containment [8].

Both CSA N287 series and N291 are listed as guidance in REGDOC-2.5.2.

### 3.2. USNRC

New reactor designs in the US are assessed against the criteria outlined in 10 CFR Part 50 [9] or 10 CFR Part 52 [10] although the substantive regulations are largely equivalent. Additionally, the NRC is currently developing another licensing pathway for new reactor designs: 10 CFR Part 53, "Risk-Informed, Technology-Inclusive Regulatory Framework for Commercial Nuclear Plants."

GEH has entered into an agreement with the TVA to develop a construction permit application under 10 CFR Part 50 to potentially deploy a BWRX-300 at the Clinch River site. As such, the NRC has focused on the regulatory requirements in Part 50 to assess the design.

For the BWRX 300 integrated RB, the SCCV and other internal structures, the applicable NRC regulations include:

- 10 CFR 50.34, “Contents of applications; technical information,”
- 10 CFR 50.44, “Combustible gas control for nuclear power reactors,”
- 10 CFR 50.55a, “Codes and Standards,”
- 10 CFR 50.65, “Requirements for monitoring the effectiveness of maintenance at nuclear power plants,”
- 10 CFR 50.150 “Aircraft Impact Assessment,”
- 10 CFR Part 50, Appendix A, “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 Part 50, Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,”
- 10 CFR Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,” and
- 10 CFR Part 50, Appendix S, “Earthquake Engineering Criteria for Nuclear Power Plants.”

Applicable NRC guidance, including regulatory guides (RGs) are as follows:

- NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants” (SRP),
- 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,”
- 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.”
- RG 1.57, “Design Limits and Loading Combinations for Metal Primary Reactor Containment System Components.”
- RG 1.136, “Design Limits, Loading Combinations, Materials, Construction, and Testing of Concrete Containments.”
- RG 1.142, “Safety-Related Concrete for Nuclear Power Plants (Other than Reactor Vessels and Containments).”

Applicable Industry Codes and Standards

- American Society of Mechanical Engineers (ASME) B&PV Code, Section III, Division 1 and Division 2, and Section XI [11]
- American National Standards Institute (ANSI)/American Institute of Steel Construction (AISC) N690-18, Appendix N9 [12]
- American Society of Civil Engineers (ASCE)/Structural Engineering Institute (SEI) 43-19 [13]

## 4. Technical Evaluation

### 4.1. Description of BWRX-300 Reactor Building and Containment Structures [4]

The BWRX-300 integrated RB including walls, floors, and RB roof are designed to act in an integrated manner to provide suitable load path for gravity and lateral loads. The RB structure is a cylindrical-shaped, shear wall building that is deeply embedded to an approximate depth of 36 meters below grade. The walls, floors, roof, and basemat of the RB structure are intended to be primarily constructed using Steel Bricks™.

The containment structure consists of the SCCV which is constructed of Steel Bricks™ and other metal components that are not made of Steel Bricks™, such as the steel containment closure head, hatches, and penetrations. The metal components not backed by concrete at the containment boundary are ASME Class MC components and are designed and constructed in accordance with ASME, Section III, Division 1, Subsection NE, and are not within the scope of this document. The containment structure, including SCCV and containment internal structures, and the RB structure are integrated at the basemat and at the connections of wing walls and elevated floor slabs, including the reactor well slab and the walls.

### 4.2. Description of Steel-Plate Composite (SC) Structures [4]

Traditional SC structures consist of steel faceplates with concrete fill, with steel anchors providing composite behavior between faceplates, and concrete and steel tie bars/rods providing structural integrity and acting as shear reinforcement (see Figure 4.2-1).

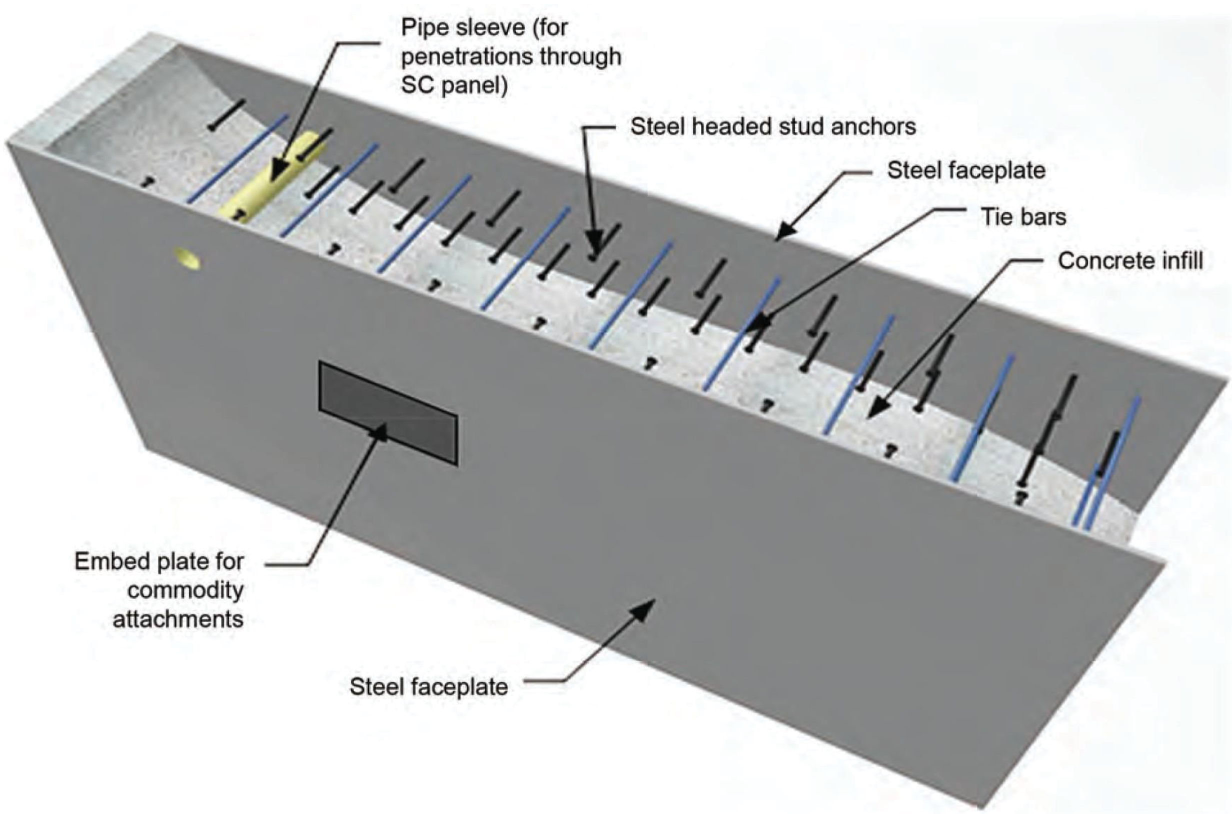


Figure 4.2-1: Typical Steel-Plate Composite Structure [4]

### 4.3. Description of Steel Bricks™ [4]

Steel Bricks™ is a patented SC modular system used in the construction of most walls and floors of the integrated BWRX-300 RB, wherein the use of steel tie bars/rods in traditional SC systems is replaced by steel diaphragm plates. GEH claims that the use of Steel Bricks™ improves modular construction and quality because it allows fabrication and assembly of modules in a controlled manner in a remote facility from the construction site.

Figure 4.3-1 below shows typical fabrication steps of Steel Bricks™:

(i) cutting the steel-plate to the desired shape,

(ii) folding the steel-plate in a press to create an L-shaped section,

(iii) welding shear studs to the inside surfaces of the plates,

(iv) assembling the wall or floor modules by welding the individual L-shapes to each other into U-shaped bricks,

(v) welding the U-shaped bricks end-to-end to form larger modules.

The diaphragm plates prevent distortion during assembly and erection. The headed shear studs prevent local buckling of the faceplates and ensures sufficient strength at the steel-concrete interface to generate composite behavior. Properly sized holes in the diaphragm plates provide a pathway for concrete to flow between U-shaped steel modules.

Figure 4.3-1: Construction of Steel Bricks™ [4]

## 4.4. Codes & Standards Evaluation

GEH proposes to use the following codes and standards in the design of the BWRX-300 integrated RB, consisting of the containment structure, including SCCV and containment internal structures, and the RB structure, along with alternative approaches, as they apply to Canada and the U.S.

**Reactor Building**:

- Canadian Codes & Standards: CSA N287 series [7], CSA N291 [8]

- U.S. Codes & Standards: American National Standards Institute (ANSI)/American Institute of Steel Construction (AISC) N690-18, Appendix N9 [12], American Society of Civil Engineers (ASCE)/Structural Engineering Institute (SEI) 43-19 [13]

The CNSC and NRC staff find this approach reasonable as existing accepted codes and standards are used in both countries. Although, as noted in section 5 of this report, the design basis is incomplete in terms of codes and standards and will be further evaluated as part of the LTR staff review [16].

**Containment Vessel (SCCV):**

- Canadian Codes & Standards: CSA N289.3 [14]

- The ASME B&PV Code Section III does not provide requirements for an SCCV (i.e., containments made from SC structures). GEH has submitted a Code Case to ASME B&PV Code Section III to provide design requirements for an SCCV based on the framework of ASME B&PV Code Section III, Division 2, for Concrete Containments, to the extent applicable and supplement with additional technical bases.

The CNSC and NRC staff find this approach reasonable as existing accepted codes and standards are used in both countries. Although as noted in section 5 of this report, the design basis is incomplete in terms of codes and standards and will be further evaluated as part of the LTR staff review [16].

### 4.5. Prototype Test Observation

At the invitation of GEH, the NRC and CNSC staff observed one of 14 scaled prototype tests performed as part of US Department of Energy sponsored National Reactor Innovation Center (NRIC) Demonstration Program Phase 1 (Detailed Design and Structural Performance Testing) at Purdue University. The main objectives of the prototype tests are to demonstrate the structural performance of Steel Bricks™ under design-basis and beyond design-basis loading conditions. The scaled prototype specimens were constructed and tested for various loading conditions applicable for containment (i.e., pressure-retaining) and non-containment applications. The specific test observed by the NRC and CNSC staff was the 1:3 scale combined In-Plane (IP) Shear + Out-Of-Plane (OOP) Shear test performed on April 7, 2023.

The test was conducted by applying constant force in the OOP direction and then applying gradually increasing/decreasing cyclic forces in the IP direction depicting the design demands of lateral earth pressures and cyclic design-basis earthquake (DBE) loads, respectively. The scaled test specimen was designed to be representative of the RB exterior wall-to-mat foundation connection. It included a splice connection at the interface between the mat foundation module and the wall module. During the tests, the displacements and strain measurements at the critical locations were viewed live and recorded for future engineering assessments.

The structural integrity of the sections of Steel Bricks™ were maintained until the end of the test where IP was loaded to two times the yield displacement. The test was terminated before failure of any connection members. Therefore, the test verified that the connection details can withstand design demands without connection failure at Steel Bricks™ RB-to-basemat connections.

Code equations in AISC N690 were initially applied in developing models to demonstrate how the specimen will behave. The test results passed the acceptance criterion by exceeding the expected IP flexural capacity, which was based on the linear interaction between IP and OOP flexure capacities. The failure mode was also observed to be dominated by ductile steel behavior. The CNSC and NRC staff were able to witness how the test results confirmed that the applicable code equations in AISC N690 (as-is or modified where necessary) can conservatively estimate the SC performance under DBE and lateral earth pressures.

The NRC and CNSC staff also toured the Purdue Bowen Laboratory, observed test set-up, and examined tested specimens from previously conducted IP shear, OOP shear and missile impact tests.

## 5. CNSC–USNRC Joint Conclusion

The CNSC and the NRC have reviewed the white paper and concluded that GEH's proposed approach for the design of BWRX-300 SCCV and RB is reasonable to demonstrate the acceptability of the licensing approach and to prepare for additional submittals regarding the BWRX-300 SMR design and licensing basis related to SC. GEH recognizes the proposed design is not covered in its entirety by the existing design codes, and has an appropriate plan to bridge those gaps. The following key points have been identified during the review:

- The overall licensing approach for BWRX-300 SC structures is acceptable. Acceptability of information provided in subsequent submissions will be duly evaluated when available.

- The development of the design-basis is incomplete as testing is underway (spring 2023) as part of US Department of Energy sponsored NRIC Advanced Construction Technology project in the US. The LTR submitted in May 2023 [16], provides more information on the design and its technical basis.

- There are many design details that both regulators expect to be addressed. Examples of those are SC basemat thickness, typical steel-SC materials dimensions, material specification, and dissimilar metal interactions on the inner side of the SC spent fuel pool structure, including the details of the process for connecting stainless steel to carbon steel, damping, ductility, constructability and aging management considerations.

- Canadian regulations require that aging management is considered as part of design and this needs to be demonstrated for the SC design.

- The list of applicable US NRC regulations and RGs in the white paper needs to be further detailed and augmented.

## 6. References


1. "Memorandum of Cooperation on Advanced Reactor and Small Modular Reactor Technologies between the United States Nuclear Regulatory Commission and the Canadian Nuclear Safety Commission," August 15, 2019 (ML19275D578)
2. "Memorandum of Understanding between the United States Nuclear Regulatory Commission and the Canadian Nuclear Safety Commission for the Exchange of Technical Information and Cooperation in Nuclear Safety Matters," August 2017 (ML196168A017)
3. NRC-CNSC MOC BWRX300 Advanced Construction Technique Project Work Plan Rev. 1 Advanced Reactor Technologies and Small Modular Reactors Committee,“ (ML22354A080)
4. GE-Hitachi Nuclear Energy Americas LLC (GEH) White Paper – "NEDO-33988, Revision 0, BWRX-300 Steel-Plate Composite (SC) Containment Vessel (SCCV) and Reactor Building Structural Design White Paper," dated October 14, 2022 (ML22287A177, e-doc # 6891712)
5. CNSC, Nuclear Safety and Control Act, January 2017
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7. CSA N287 series
8. CSA N291, Requirements for Safety-Related Structures for Nuclear Power Plants, CSA Group, 2019
9. 10 CFR Part 50, "Domestic licensing of production and utilization facilities"
10. 10 CFR Part 52, "Licenses, certifications, and approvals for nuclear power plants"
11. ASME Boiler and Pressure Vessel Code, Section III, Division 1 and Division 2, and Section XI
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13. American Society of Civil Engineers (ASCE)/Structural Engineering Institute (SEI) 43-19
14. CSA N289.3, "Design procedures for seismic qualification of nuclear power plants"
15. Charter - NRC/CNSC Collaboration on GE-Hitachi's BWRX-300 Design (ML22284A024)
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