

ENCLOSURE 1

M200109

Supplemental Response to Request for Additional Information
(eRAI) 9746

Licensing Topical Report
NEDC-33911P, Revision 0,
BWRX-300 Containment Performance

Non-Proprietary Information

eRAI No.: 9746

Date of eRAI Issue: 07/10/2020

NRC Question 03.06.02-4

SER Section 3.6.2: Section 2.2.2, “Containment Design Requirements,” in NEDC-33911 states that ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NE-1120 and the design criteria from NRC Branch Technical Position (BTP) 3-4, “Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment,” Part B, Items 1(ii)(1)(d) and (e), are applied to eliminate postulating breaks and cracks in those portions of piping from the containment wall to including the outboard containment isolation valves (CIVs). Similar statements are also included in Section 5.1.7, “10 CFR Part 50, Appendix A, GDC 4,” in NEDC-33911. Eliminating postulated breaks and cracks in those portions of piping from the containment wall is safety significant to provide assurance that the containment of the BWRX-300 reactor will not be breached and cause a radioactive release to the environment that exceeds regulatory requirements.

- a. The NRC staff requests that GEH clarify that BTP 3-4, Part B, Items 1(ii)(2) through (7), if applicable, are also applied to eliminate postulating breaks and cracks in those portions of the piping.
 - b. The NRC staff requests GEH describe how the BWRX-300 design requirements will provide assurance that the functionality of those outboard CIVs will not be affected by the dynamic effects resulting from postulated pipe breaks beyond those portions of piping from the containment wall to including the outboard CIVs.
-

GEH Supplemental Response to NRC Question 03.06.02-4

- a. The BWRX-300 will meet BTP 3-4 guidance similarly to the Economically Simplified Boiling Water Reactor (ESBWR) described in Design Control Document (DCD) 26A6642A5, Revision 10, Sections 3.6.1.1 and 3.6.2. In addition to ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subarticle NE-1120 and the design criteria from Branch Technical Position (BTP) 3-4, Items 1(ii)(1)(d) and (e), BTP 3-4, Items 1(ii)(2) through (7) will also be applied to eliminate postulated breaks and cracks in those portions of piping from the containment wall to ~~including~~ the outboard containment isolation valves (CIVs).

Licensing Topical Report (LTR) NEDC-33911P, Revision 0, Section 2.2.2, Design Requirements and Section 5.1.7 will be revised to address eliminating postulated breaks and cracks in those portions of the piping considering the additional guidance of BTP 3-4, Part B, Items 1(ii)(2) through (7).

- b. ~~BTP 3-4, B.1.(ii) Fluid System Piping in Containment Penetration Areas states that breaks and cracks need not be postulated in those portions of piping from containment wall to and including the inboard or outboard isolation valves provided that they meet the design criteria of ASME Code, Section III, Subarticle NE-1120 and additional design criteria (1) through (7). As stated in LTR NEDC-33911P, Section 2.2.2, Design Requirements, the BWRX-300 design applies the ASME Code Section III, Subarticle NE-1120 design criteria as well as BTP 3-4 Items 1(ii)(1)(d) and (e) for ASME Code, Section III, Class 2 piping. In response to item a~~

~~above, BTP 3-4, Items 1(ii)(2) through (7) design criteria will also be applied to those portions of piping from containment wall to including the outboard CIV. As a result of applying the design criteria of ASME Code, Section III, Subarticle NE-1120 and BTP 3-4, Part B, Items 1(ii)(1)(d) and (e), and Items 1(ii)(2) through (7), the dynamic effects of postulated breaks and cracks in those portions of the piping from the containment wall to the outboard CIV are not considered in the BWRX-300 design. No other additional changes to LTR NEDC-33911P are warranted as a result of adding BTP 3-4, Part B Items 1(ii)(2) through (7). As discussed in response to NRC Questions 03.06.02-5 and 03.06.02-6, the BWRX-300 design will consider the dynamic effects of jet loads, pipe whipping, postulated high-energy pipe breaks, missiles and discharging fluids in the containment design and associated piping, valves, penetrations, and instrument lines in future licensing activities. These dynamic effects on containment piping for those portions of piping beyond and including the outboard CIVs will be evaluated for postulated breaks and cracks. LTR NEDC-33911P, Section 5.1.7 will be revised to address evaluating the dynamic effects of postulated breaks and cracks in those portions of the piping beyond and including the outboard CIVs in future licensing activities.~~

Proposed Changes to NEDC-33911P, Revision 0

- a. NEDC-33911P, Revision 0, will be revised to reflect the revision of bullet five to Subsection 2.2.2, Design Requirements, and Section 5.1.7, 10 CFR 50 Appendix A, GDC 4, Statement of Compliance, to add compliance to the guidance of BTP 3-4, Part B, Items 1(ii)(2) through (7) that eliminates postulated breaks and cracks in piping in those portions of the piping from the containment wall up to the outboard CIVs:

...

2.2.2 Containment Design Requirements

...

Design Requirements:

...

- ASME B&PV Code, Section III, Division 1, Subarticle NE-1120, and the design criteria from BTP 3-4, Part B, Items 1(ii)(1)(d) and (e), and Items 1(ii)(2) through (7), are applied to eliminate postulated breaks and cracks in those portions of piping from the containment wall to the outboard CIVs.

5.1.7 10 CFR 50 Appendix A, GDC 4

...

Statement of Compliance: ... As described in this LTR, the BWRX-300 design requirements include applying the design criteria from NUREG-0800, SRP, BTP 3-4, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," Part B, Items 1(ii)(1)(d) and (e), and Items 1(ii)(2) through (7) to eliminate postulating breaks and cracks in those portions of piping from containment wall to ~~and including~~ the outboard CIVs.

Supplemental Response to BWRX-300 Request for Additional Information (eRAI) 9746
Non-Proprietary Information

- b. NEDC-33911P, Revision 0, Section 5.1.7, 10 CFR 50 Appendix A, GDC 4, Statement of Compliance, will be revised to address evaluating the dynamic effects of postulated breaks and cracks in those portions of the piping beyond and including the outboard CIVs in future licensing activities:

...

5.1.7 10 CFR 50 Appendix A, GDC 4

...

Statement of Compliance: ... The dynamic effects of postulated breaks and cracks in those portions of the piping beyond and including the outboard CIVs will be evaluated in future licensing activities.

eRAI No.: 9746

Date of eRAI Issue: 07/10/2020

NRC Question 03.06.02-5

SER Section 3.6.2: Section 3.1, “Scope of the Evaluation Model,” in NEDC-33911 states that jet loads resulting from pipe breaks are not in the scope of the evaluation method described in this section for the BWRX-300 containment response. GEH further stated that the jet loads and zone of influence are evaluated using a separate structural method that will be described during future licensing activities. Consideration of jet loads and zone of influence is safety significant to provide assurance that a breach in the containment of the BWRX-300 reactor will not occur and cause a radioactive release to the environment that exceeds regulatory requirements. The NRC staff requests that GEH clarify that the BWRX-300 containment response to all of the dynamic effects (not only the jet loads) resulting from postulated high-energy pipe breaks, including the effects of missiles, pipe whipping, and discharging fluids, if applicable, will be evaluated and described during future licensing activities to comply with the pertinent 10 CFR Part 50, Appendix A, GDC 4 requirements.

GEH Response to NRC Question 03.06.02-5

The BWRX-300 design will consider the dynamic effects of jet loads, pipe whipping, postulated high-energy pipe breaks, missiles and discharging fluids in the containment design and associated piping, valves, penetrations, and instrument lines in future licensing activities. NEDC-33911P, Revision 0, Section 3.1 and Section 5.1.7 will be revised to include the dynamic effects of jet loads, pipe whipping, postulated high-energy pipe breaks, missiles and discharging fluids in the BWRX-300 design of containment and CIV design features.

Proposed Changes to NEDC-33911P, Revision 0

NEDC-33911P, Revision 0, Sections 3.1 and 5.1.7 will be revised to reflect the dynamic effects of pipe whipping, postulated high-energy pipe breaks, missiles and discharging fluids to comply with the design requirements of 10 CFR 50. Appendix A, GDC 4:

3.1 Scope of the Evaluation Model

...

[The dynamic effects of jet loads, pipe whipping, postulated high-energy pipe breaks, missiles and discharging fluids will be evaluated in design of the containment and CIVs, and described during future licensing activities to comply with the design requirements of 10 CFR 50, Appendix A, GDC 4.](#)

5.1.7 10 CFR 50 Appendix A, GDC 4

...

Statement of Compliance: The BWRX-300 containment and CIVs design features ... are to be designed to effects of, and to-be compatible with, the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant

Supplemental Response to BWRX-300 Request for Additional Information (eRAI) 9746
Non-Proprietary Information

accidents, and will consider the dynamic effects of jet loads, pipe whipping, postulated high-energy pipe breaks, missiles and discharging fluids. . . .

eRAI No.: 9746

Date of eRAI Issue: 07/10/2020

NRC Question 03.06.02-6

SER Section 3.6.2: Section 5.1.7 in NEDC-33911 states that breaks and cracks in those portions of piping from the RPV isolation valves that function as the inboard CIVs to the containment wall remain postulated to occur, and the dynamic effects of those postulated pipe breaks are to be evaluated in the BWRX-300 design. The NRC staff notes that during its review of NEDC-33910, in RAI Question 03.06.02-2, the NRC staff requested that GEH describe how the BWRX-300 design requirements will provide assurance that the functionality of those dual function safety-related valves will not be affected by the dynamic effects resulting from the postulated pipe breaks. In a letter dated May 4, 2020, GEH responded to the staff's request by referencing Section 5.1.7 in NEDC-33911, and stated that the BWRX-300 design will meet the requirements of 10 CFR Part 50, Appendix A, GDC 4. In addition, GEH stated that qualification, such as compliance with ASME Standard QME-1-2007 (or a later edition) as accepted in NRC Regulatory Guide 1.100, will be addressed in the detailed design of the valves and will be specified during future licensing activities. The capability of CIVs to perform their design-basis functions is safety significant to provide assurance that the containment of the BWRX-300 reactor can be safely isolated and prevent radioactive release to the environment that exceeds regulatory requirements. The NRC staff requests that GEH update Section 5.1.7 in NEDC-33911 to describe the valve qualification in compliance with ASME Standard QME-1-2007 as described above.

GEH Response to NRC Question 03.06.02-6

BWRX-300 containment isolation valve qualification, using ASME Standard QME-1-2007 (or later edition) as accepted in NRC Regulatory Guide 1.100, will be addressed in the detailed design of the valves and will be specified during future licensing activities. NEDC-33911P, Revision 0, Sections 2.2.7 and 5.1.7 will be revised to reflect the use of the ASME Standard QME-1-2007 (or later edition).

Proposed Changes to NEDC-33911P, Revision 0

NEDC-33911P, Revision 0, Sections 2.2.7 and 5.1.7 will be revised to add valve qualification compliance to ASME Standard QME-1-2007 or later edition:

2.2.7 Containment Isolation Valves

Design Requirements:

...

- [Valve qualification, such as compliance with ASME Standard QME-1-2007 \(or later edition\) as endorsed by NRC Regulatory Guide \(RG\) 1.100, will be addressed in the detailed design and the procurement process of the valves, and will be specified during future licensing activities.](#)

Supplemental Response to BWRX-300 Request for Additional Information (eRAI) 9746
Non-Proprietary Information

5.1.7 10 CFR 50 Appendix A, GDC 4

. . .

Statement of Compliance: . . . Internal containment flooding is to be evaluated during future licensing activities. Valve qualification, such as compliance with ASME Standard QME-1-2007 (or later edition) as endorsed by NRC Regulatory Guide (RG) 1.100, will be addressed in the detailed design and the procurement process of the valves, and will be specified during future licensing activities.