ENCLOSURE 4

M200064

Response to Request for Additional Information eRAI 9730

Licensing Topical Report NEDC-33910P, Revision 0, BWRX-300 Reactor Pressure Vessel Isolation and Overpressure Protection

Non-Proprietary Information

PROPRIETARY INFORMATION NOTICE

This is a non-proprietary version of the Response to Request for Additional Information eRAI 9730, Licensing Topical Report NEDC-33910P, Revision 0, BWRX-300 Reactor Pressure Vessel Isolation and Overpressure Protection, from which the proprietary information has been removed. The header of each page in this enclosure carries the notation "Non-Proprietary Information." Portions of the enclosure that have been removed are indicated by an open and closed bracket as shown here [[ ]].

eRAI No.: 9730
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NRC Question 03.09.06-1

Section 2.1.2 in NEDC-33910 describes the Isolation Condenser System (ICS) for the BWRX-300 nuclear power plant. This section indicates that the ICS includes [[
]]. To support the NRC staff review of NEDC-33910P [sic] and its conformance to 10 CFR Part 50, Appendix A, GDC 1, 2, 4, 35 and 37 for the IC condensate return valves, the NRC staff requests that GEH describe the following:

(a) Any first of a kind (FOAK) features,

(b) Valve and actuator types,

(c) Valve size,

(d) Qualification, such as compliance with ASME Standard QME-1-2007 (or later edition) as accepted in NRC Regulatory Guide 1.100,

(e) Plans for valve and actuator diversity,

(f) Incorporation of lessons learned from international operating experience where ICS valves failed to open as designed,

(g) Accessibility for inservice testing (IST) activities in accordance with 10 CFR 50.55a,

(h) Design features to avoid thermal binding or pressure locking of the valves, and

(i) OM Code leakage classification.

If any of this information is not available at this time, the staff requests that GEH indicate its plans to provide this information during future licensing activities for the BWRX-300 nuclear power plant.

GEH Response to NRC Question 03.09.06-1

Although detailed design of the IC condensate return valves has not yet been completed, the design functions and features of the IC condensate return valves are anticipated to be like what is described in Section 5.4.6 of the Economically Simplified Boiling Water Reactor (ESBWR) Design Control Document (DCD). Compliance with the requirements of 10 CFR 50, Appendix A, General Design Criteria (GDC) 1, GDC 2, GDC 4, and GDC 37 for the IC condensate return valves is anticipated to be the same as described in Section 5.4.6 of the ESBWR DCD. However, NEDC-33910P is not requesting NRC approval for the IC condensate return valves to meet these GDC. Instead, it is requested that the limited design requirements specified for the ICS including the IC condensate return valves be found acceptable for ensuring that the ICS can perform the limited functions that are a subject of NEDC-33910P in demonstrating compliance with 10 CFR 50, Appendix A, GDC 35. These include the following design functions:

- ICS is initiated automatically on high reactor pressure vessel (RPV) pressure indicating an overpressure event or on signals indicating a loss-of-coolant accident (LOCA).

- [[
]]
- [[ ]]
- [[
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- [[
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- [[
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- [[
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- [[
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- [[
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- [[
]]

NEDC-33910P did not describe compliance with 10 CFR 50 Appendix A, GDC 2, and will be revised to include this information. The conclusion of this additional information to be provided is that the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 2. Subsection 5.1.6 of NEDC-33911P, BWRX-300 Containment Performance, also describes that the RPV isolation valves will comply with 10 CFR 50 Appendix A, GDC 2.

As described in NEDC-33910P, the combined design features of the [[
]] meet the definition of an ECCS as described in 10 CFR 50.46(a)(1)(i) that has a calculated cooling performance following postulated LOCAs in compliance with the criteria set forth in 10 CFR 50.46(b). In addition, the [[ ]] are effective as an ECCS for breaks in pipes in the RCPB up to and including a break equivalent in size to the double ended rupture of the largest pipe in the RCS in compliance with the definition of a LOCA in 10 CFR 50.46(c)(1). The [[ ]] has the capability to provide more than sufficient emergency core cooling. [[

]] The analyses to demonstrate compliance will be provided during future licensing activities. Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 35.

NEDC-33910P did not describe compliance with 10 CFR 50 Appendix A, GDC 37, and will be revised to include this information. The conclusion of this additional information to be provided is that the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 37.

The details of the design functions and features beyond those requirements described above and already described in NEDC-33910P are to be addressed in future licensing activities, either by GEH in support of a 10 CFR 52 Design Certification Application (DCA) or by a license applicant for requesting a Construction Permit (CP) and Operating License (OL) under 10 CFR 50 or a Combined Operating License (COL) under 10 CFR 52. The following discussions address the specific questions provided:

(a) No FOAK features will be specified for the IC condensate return valves.

(b) Valve and actuator types will be addressed in the detailed design of the valves.

(c) Valve size will be addressed in the detailed design of the valves and will be specified during future licensing activities.

(d) Qualification, such as compliance with 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.

(e) As described in NEDC-33910P, the [[

]] These requirements provide for sufficient description of valve and actuator diversity in support of the NEDC-33910P conclusions that [[

]].

(f) Incorporation of lessons learned from international operating experience where ICS valves failed to open as designed will be addressed in the detailed design of the valves and will be specified during future licensing activities. However, NEDC-33910P will be revised to include discussion for Generic Letter 95-07, Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves, as this operating experience may be applicable to the detailed design of the valves.

(g) Accessibility for IST activities in accordance with 10 CFR 50.55a will be addressed in the detailed design of the valves and will consider IST requirements like those described in ESBWR DCD, Tier 2, 26A6642AK, Rev. 10, April 2014, Table 3.9-8. The IC condensate return valves design features are to be designed using the standards approved in 10 CFR 50.55a(a) in effect within six months of any license application, either by GEH in support of a 10 CFR 52 DCA or by a license applicant for requesting a CP and OL under 10 CFR 50 or a COL under 10 CFR 52. The specific IST requirements for the BWRX-300 design will be specified during future licensing activities.

(h) Design features to avoid thermal binding or pressure locking of the valves are not necessary for the IC condensate return valves. During normal operation with the ICS in standby, there are [[

]].

(i) IST requirements will be like those described in ESBWR DCD, Tier 2, 26A6642AK, Rev. 10, April 2014, Table 3.9-8, which consists of position indication verification (ASME OM Code Paragraph ISTC-3700), stroke open testing (ASME OM Code Paragraph ISTC-3521), and fail open testing (ASME OM Code Paragraph ISTC-3560). Like the ESBWR, the IC condensate return valves are classified as ASME OM Code Category B valves, and do not require leakage testing. However, the specific IST requirements for the BWRX-300 design will be specified during future licensing activities.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to add the following as new Subsections 4.1.5 and 4.1.13 to address compliance with 10 CFR 50, Appendix A, GDC 2 and GDC 37, and to address addition of Generic Letter 95-07 as new Subsection 4.5.2:

. . .

4.1.5 10 CFR 50 Appendix A, GDC 2

- Regulatory Requirement: 10 CFR 50 Appendix A, GDC 2, Design bases for protection against natural phenomena, requires that SSCs important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

  Statement of Compliance: The BWRX-300 RPV isolation and overpressure protection design features, [[ ]] are to be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. Specific design requirements for the [[ ]] used to verify the capability to perform their safety functions, and the natural phenomena and effects evaluated, will be provided during future licensing activities.

  Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 2.

. . .

4.1.13 10 CFR 50 Appendix A, GDC 37

- Regulatory Requirement: 10 CFR 50 Appendix A, GDC 37, Testing of emergency core cooling system, requires that the emergency core cooling system shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and performance of the active components of the system, and (3) the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence

that brings the system into operation, including operation of applicable portions of the protection system, the transfer between normal and emergency power sources, and the operation of the associated cooling water system.

Statement of Compliance: As previously described, the combined design features of the [[ ]] meet the definition of an ECCS as described in 10 CFR 50.46(a)(1)(i) that has a calculated cooling performance following postulated LOCAs in compliance with the criteria set forth in 10 CFR 50.46(b). In addition, the [[ ]] are effective as an ECCS for breaks in pipes in the RCPB up to and including a break equivalent in size to the double-ended rupture of the largest pipe in the RCS in compliance with the definition of a LOCA in 10 CFR 50.46(c)(1). The [[ ]] has the capability to provide more than sufficient emergency core cooling, which is assured for breaks in pipes in the RCPB up to and including a break equivalent in size to the double ended rupture of the largest pipe in the RCS through the use of [[

]].

Specific requirements for periodic pressure and functional testing of the [[ ]] to assure (1) the structural and leaktight integrity of these components, (2) the operability and performance of these active components, and (3) the operability of the systems as a whole containing the [[ ]] will be provided during future licensing activities.

Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 37.

. . .

4.5.2 Generic Letter 95-07

Generic Letter 95-07, Pressure Locking and Thermal Binding of Safety-Related Power-Operated Gate Valves, dated August 17, 1995, contains a request to ensure that safety-related power-operated gate valves that are susceptible to pressure locking or thermal binding are evaluated to ensure they are capable of performing the safety functions described in the licensing basis. This guidance will be evaluated for applicability during future licensing activities.

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NRC Question 03.09.06-2

Section 2.2 in NEDC-33910 provides a general overview of reactor pressure vessel (RPV) isolation concept, and Section 2.5 in NEDC-33910 specifies the RPV isolation valve design requirements for the BWRX-300 nuclear power plant. These sections indicate that there will be [[

]] To support the NRC staff review of NEC-33910 and its conformance to 10 CFR Part 50, Appendix A, GDC 1, 2, 4, 54, 55, and 56 for the RPV isolation valves, the NRC staff requests that GEH describe the following:

(a) Any FOAK features,

(b) Valve types and sizes,

(c) Qualification, such as compliance with ASME Standard QME-1-2007 (or later edition) as accepted in NRC Regulatory Guide 1.100,

(d) Plans for valve diversity,

(e) Accessibility for IST activities in accordance with 10 CFR 50.55a,

(f) Design to avoid thermal binding or pressure locking of the valves, and

(g) ASME OM Code leakage classification.

If any of this information is not available at this time, the staff requests that GEH indicate its plans to provide this information during future licensing activities for the BWRX-300 nuclear power plant.

GEH Response to NRC Question 03.09.06-2

The detailed design of the RPV isolation valve assemblies has not yet been completed. Compliance with the requirements of 10 CFR 50, Appendix A, General Design Criteria (GDC) 1, GDC 2 and GDC 4 for the RPV isolation valve assemblies is anticipated to be the same as for other ASME Class 1 valves described in the ESBWR DCD. Therefore, the BWRX-300 will comply with the requirements of GDC 1, GDC 2 and GDC 4 for the RPV isolation valve assemblies. NEDC-33910P is requesting that the limited design requirements specified for the RPV isolation valve assemblies be found acceptable for ensuring that the limited functions that are a subject of NEDC-33910P are met in demonstrating compliance with 10 CFR 50, Appendix A, GDC 33 and GDC 35.

Compliance with the requirements of 10 CFR 50, Appendix A, GDC 54, GDC 55, and GDC 56 as related to the design of the [[ ]] are described in Subsections 5.1.21, 5.1.22 and 5.1.26 of NEDC-33911P, Revision 0, BWRX-300 Containment Performance.

The details of the design functions and features beyond those requirements described above and already described in NEDC-33910P are to be addressed in future licensing activities, either by GEH in support of a 10 CFR 52 DCA or by a license applicant for requesting a CP and OL under 10 CFR 50 or a COL under 10 CFR 52. The following discussions address the specific questions provided:

(a) Any FOAK features will be addressed in the detailed design of the valves and will be specified during future licensing activities.

(b) Valve types and sizes will be addressed in the detailed design of the valves and will be specified during future licensing activities.

(c) Qualification, such as compliance with 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.

(d) As described in NEDC-33910P, the [[
]] These requirements provide for sufficient description of diverse actuation in support of the NEDC-33910P conclusions that the [[

]] to meet the criteria in 10 CFR 50.46(b)(1) through 10 CFR 50.46(b)(5). The [[

]] for any breaks that would result in a loss of reactor coolant at a rate in excess of the capability of the nonsafety-related normal reactor coolant makeup systems, which for the BWRX-300 includes LOCA break sizes [[
]]. The worst-case single failure affecting the [[
]] does not prevent fulfillment of the required ECCS design functions. Therefore, there is no need for the [[
]].

(e) Accessibility for IST activities in accordance with 10 CFR 50.55a will be addressed in the detailed design of the valves and will consider IST requirements like those described in ESBWR DCD, Tier 2, 26A6642AK, Rev. 10, April 2014, Table 3.9-8, for other active ASME Class 1 valves. The specific IST requirements for the BWRX-300 design will be specified during future licensing activities.

(f) Design features to avoid thermal binding or pressure locking of the valves are not necessary for the RPV isolation valves. The safety function of the RPV isolation valves is to close as opposed to having an opening safety function. Automatic actuation of [[
]] performs the function to mitigate the effects of a LOCA. [[ ]] is a one-time action to open

or close appropriate valves during accident response which may also be initiated manually as a one-time action if necessary.

As described in NEDC-33910P all BWRX-300 RPV isolation valves shall have a proven low leakage potential. Design and administrative leakage limits are applied to valve selection during the BWRX-300 preliminary design and are based on plant design and event evaluations using offsite dose consequences compared to regulatory limits as well as containment design limits. The leakage criteria are analyzed as part of the plant safety analysis. Therefore, the RPV isolation valves are classified as ASME OM Code Category A valves requiring a seat leakage rate test (ASME OM Code Paragraph ISTC-3600). IST requirements will be like what is described in ESBWR DCD, Tier 2, 26A6642AK, Rev. 10, April 2014, Table 3.9-8, for ASME Class 1 valves. The specific IST requirements for the BWRX-300 design will be specified during future licensing activities.

Proposed Changes to NEDC-33910P, Revision 0

None

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NRC Question 03.09.06-3

Section 2.6 in NEDC-33910 specifies the RPV isolation valve actuator design requirements for the BWRX-300 nuclear power plant. This section specifies that the valve and actuator designs will be qualified with ASME QME-1. This section refers to several aspects for consideration or to be considered as part of the RPV isolation valve actuator design requirements. To support the NRC staff review of NEDC-33910 [sic] and its conformance to 10 CFR Part 50, Appendix A, GDC 1, 2, 4, 54, 55, and 56 for the RPV isolation valve actuator design requirements, the NRC staff requests that GEH describe the following:

(a) Any FOAK features,

(b) Actuator types,

(c) Specific QME-1 edition for qualification, such as compliance with ASME Standard QME-1-2007 (or later edition) as accepted in NRC Regulatory Guide 1.100,

(d) Plans for actuator diversity,

(e) Accessibility for IST activities in accordance with 10 CFR 50.55a, and

(f) Intent of terms such as "consideration" and "considered" in this section and elsewhere in NEDC-33910.

If any of this information is not available at this time, the staff requests that GEH indicate its plans to provide this information during future licensing activities for the BWRX-300 nuclear power plant.

GEH Response to NRC Question 03.09.06-3

The detailed design of the RPV isolation valve actuators has not yet been completed. Compliance with the requirements of 10 CFR 50, Appendix A, General Design Criteria (GDC) 1, GDC 2 and GDC 4 for the RPV isolation valve actuators is anticipated to be the same as actuators for other ASME Class 1 valves described in the ESBWR DCD. Therefore, the BWRX-300 will comply with the requirements of GDC 1, GDC 2 and GDC 4 for the RPV isolation valve actuators. NEDC-33910P is requesting that the limited design requirements specified RPV isolation valve actuators be found acceptable for ensuring that the limited functions that are a subject of NEDC-33910P are met in demonstrating compliance with 10 CFR 50, Appendix A, GDC 33 and GDC 35.

Compliance with the requirements of 10 CFR 50, Appendix A, GDC 54, GDC 55, and GDC 56 as related to the design of the [[ ]] are described in Subsections 5.1.21, 5.1.22 and 5.1.26 of NEDC-33911P, Revision 0, BWRX-300 Containment Performance.

The details of the design functions and features beyond those requirements described above and already described in NEDC-33910P are to be addressed in future licensing activities, either by

GEH in support of a 10 CFR 52 DCA or by a license applicant for requesting a CP and OL under 10 CFR 50 or a COL under 10 CFR 52. The following discussions address the specific questions provided:

(a) Any FOAK features will be addressed in the detailed design of the valve actuators and will be specified during future licensing activities.

(b) Valve actuator types will be addressed in the detailed design of the valve actuators.

(c) Qualification, such as compliance with 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 valve actuators and will be specified during future licensing activities.

(d) As described in NEDC-33910P, the [[
]] The method to establish this diversity requirement will be addressed in the detailed design of the valve actuators and will be specified during future licensing activities.

(e) IST activities in accordance with 10 CFR 50.55a are specified for the RPV isolation valves as discussed in the response to NRC Question 03.09.06-2. IST requirements will be like those described in ESBWR DCD, Tier 2, 26A6642AK, Rev. 10, April 2014, Table 3.9-8, for ASME Class 1 valves. The specific IST requirements for the BWRX-300 design will be specified during future licensing activities.

(f) GEH understands that the use of terms such as "consideration" and "considered" is not appropriate where used. Therefore, the discussion containing those terms are proposed to be revised in NEDC-33910P as described below.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to replace the use of terms such as "consideration" and "considered" with appropriate terms:

. . .

2.4 Reactor Pressure Vessel Nozzle Design Requirements

. . .

[[

]]

2.4.1 Connection of Reactor Pressure Vessel Isolation Valves to the Reactor Vessel

The BWRX-300 design requirements for identifying postulated pipe rupture locations and configurations inside containment ~~consider~~conform to the guidance in Branch Technical Position (BTP) 3-4, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment."

. . .

[[ ]] the design criteria given in ASME Code Section III, Paragraph NB-3230, provides greater margin against yielding due to service loads than do the rules of Paragraph NB-3653 for typical piping system materials, even when ~~considering~~using the more restrictive limits of BTP 3-4, Part B, Item 1(ii)(1).

. . .

2.5 Reactor Pressure Vessel Isolation Valve Design Requirements

. . .

Thus, motor operated valves other than fail closed magnetic motor valves (i.e., solenoid operated valves) are not ~~considered~~used for any RPV isolation valve applications.

. . .

A critical aspect of the valve and actuator selection to ~~consider~~evaluate is the failure mode. The failure mode of the RPV isolation valves are determined based on the safety function of the connected system.

. . .

2.6 Reactor Pressure Vessel Isolation Valve Actuator Design Requirements

. . .

A key design ~~consideration~~requirement is control of the temperature at the valve actuator interface in order to limit thermal effects on the actuator assembly. The RPV isolation valves are heated by process water or steam, which also elevates valve actuator temperatures above the local ambient. Valve and valve actuator designs are qualified in accordance with ASME QME-1 [Reference 5.5] to include ~~consideration~~evaluation of the local environmental conditions, including ~~consideration~~evaluation of the effects of heat transfer from the process water or steam and Design Basis Events. [[ ]] The stem connection and actuator mounting method are studied to determine if thermal isolation needs to be implemented. High temperature seals or lubricants are ~~considered~~used for the actuators.

. . .

2.7 Categories of Pipe Breaks

. . .

Steam and liquid line breaks are ~~considered~~evaluated. The pipe breaks ~~considered~~evaluated in the safety analysis are divided into two size categories:

. . .

~~4.1.5~~4.1.6 10 CFR 50 Appendix A, GDC 4

. . .

In addition, the dynamic effects of postulated pipe breaks are to be ~~considered~~evaluated in the BWRX-300 design.

. . .

[[ ]] the BWRX-300 design requirements include ~~consideration~~evaluation of the acceptable criteria to identify postulated pipe rupture locations and configurations inside containment as specified in BTP 3-4, "Postulated Rupture Locations in Fluid System Piping Inside and Outside Containment," as discussed in Subsection 2.4.1 of this LTR.

. . .

~~4.3.1~~4.3.2 Standard Review Plan 5.2.2

. . .

It is recommended that this area of review should ~~consider~~include [[ ]].

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NRC Question 03.09.06-4

Section 4.1.1 in NEDC-33910 discusses compliance with specific requirements in 10 CFR 50.34(f) related to the TMI-2 accident lessons learned. In describing compliance with 10 CFR 50.34(f)(1)(x) with respect to nonsafety-related equipment and accounting for leakage, NEDC-33910 indicates that the [[ ]] are one-time actuation systems. The NRC staff requests that GEH clarify this section, or describe the [[

]].

GEH Response to NRC Question 03.09.06-4

As stated in NEDC-33910P, the RPV isolation valves for main steam line, feedwater, shutdown cooling, and reactor water cleanup shall fail in the closed position on loss of signal or control power. [[

]] In addition to their failure positions upon a loss of signal or control power, these valves are also placed in their required post-accident valve positions using a single automatic actuation signal.

Although the detailed design of the valves and valve actuators has not been completed, positive mechanical means shall be required in the design of the valve actuators to ensure that upon automatic actuation or a loss of signal or control power to both place and then maintain the valves in the required post-accident valve positions are to be used. These requirements are to be implemented during detailed design of the valves and actuators. Therefore, additional information requiring the use of positive mechanical means in the design of the valve actuators to maintain these valves in their required post-accident valve positions is proposed to be added to NEDC-33910P.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to add the design requirements for the use of positive mechanical means in the design of the valve actuators to maintain these valves in their required post-accident valve positions:

. . .

2.5 Reactor Pressure Vessel Isolation Valve Design Requirements

. . .

Design Requirements:

- The RPV isolation valves for main steam line, feedwater, shutdown cooling, and reactor water cleanup shall fail in the closed position, with valve actuators designed to maintain the valves closed by positive mechanical means.
- [[
  ]] with valve actuators designed to maintain the valves in their as-is position by positive mechanical means.

. . .

3.1.2 Isolation Condenser System Design Requirements

. . .

The ICS is placed into operation by opening condensate return valves and draining the condensate to the RPV, thus causing steam from the reactor to fill the tubes which transfer heat to the cooler IC pool water. [[
]] with valve actuators designed to maintain the valves in their open position by positive mechanical means.

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NRC Question 03.09.06-5

Section 4.1.1 in NEDC-33910 discusses compliance with specific requirements in 10 CFR 50.34(f). In describing compliance with 10 CFR 50.34(f)(2)(x) with respect to anticipated transient without scram (ATWS), NEDC-33910 indicates that based on [[ ]] qualification testing, the testing associated with 10 CFR 50.34(f)(2)(x) is not required. The NRC staff requests that GEH clarify this section, or explain why [[ ]] qualification testing is not subject to 10 CFR 50.34(f)(2)(x).

GEH Response to NRC Question 03.09.06-5

10 CFR 50.34(f)(2)(x) requires that a test program and associated model development be provided, and tests conducted, to qualify RCS relief and safety valves for BWRs. As stated in NEDC-33910P, [[
]]. Therefore, this requirement is not technically relevant to the BWRX-300 design. However, the [[ ]] perform a similar function during an ATWS event in providing overpressure protection and will be qualified by testing to perform their safety-related design function for fluid conditions expected under operating conditions, transients and accidents including ATWS events.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to describe this requirement as not technically relevant rather than not required, but to also indicate that the [[ ]] will be qualified by testing to perform their safety-related design function for fluid conditions expected under operating conditions, transients and accidents including ATWS events:

. . .

4.1.1 10 CFR 50.34(f)

. . .

- Regulatory Requirement: 10 CFR 50.34(f)(2)(x) requires that a test program and associated model development be provided and tests conducted to qualify RCS relief and safety valves and, for PWRs, Power-Operated Relief Valve (PORV) block valves, for all fluid conditions expected under operating conditions, transients and accidents. Consideration of ATWS conditions shall be included in the test program. Actual testing under ATWS conditions need not be carried out until subsequent phases of the test program are developed. (II.D.1)

  Statement of Compliance: The design features of the BWRX-300 RCPB include the use of the RPS [[ ]] for overpressure protection, [[

  ]]. ~~Qualification tests of the~~ [[ ]] ~~are performed to verify proper operation~~

~~under all fluid conditions expected under operating conditions, transients and accidents, and operation of the~~ [[ ]] ~~under ATWS conditions is evaluated. Based on the required~~ [[ ]] ~~qualification tests and evaluation, and because~~Because the [[ ]], this ~~test program and associated model development, including conduct of test, is not required.~~requirement is not technically relevant to the BWRX-300. However, the [[ ]] perform a similar function during an ATWS event in providing overpressure protection and will be qualified by testing to perform their safety-related design function for fluid conditions expected under operating conditions, transients and accidents including ATWS events.

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NRC Question 03.09.06-6

Section 4.1.3 in NEDC-33910 indicates that the requirements of 10 CFR 50.55a will be satisfied. This section specifically references the RPV isolation valves. This section also states that no alternative approach, exception, or exemption from these requirements is required. The NRC staff requests that GEH describe the compliance with the requirements in 10 CFR 50.55a for the [[ ]]. The staff also requests that GEH clarify the intent of the statement in this section and elsewhere in NEDC-33910 that no alternative approach, exception, or exemption from these requirements is required.

GEH Response to NRC Question 03.09.06-6

GEH understands that the use of statements like "Full compliance with these requirements is to be demonstrated in the preliminary and final design of the BWRX-300 to be completed during future licensing activities. Therefore, no alternative approach, exception, or exemption from these requirements is required" are not appropriate where used. Therefore, the discussion containing those statements, including in Section 4.1.3, are proposed to be revised in NEDC-33910P as described below for clarification of the intent, which is to provide a commitment to meeting the applicable regulatory requirements during detailed design.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to replace the use of these statements with appropriate statements of compliance to provide a commitment to meeting the applicable regulatory requirements during detailed design:

. . .

2.7 Categories of Pipe Breaks

. . .

The emergency core cooling system (ECCS) evaluation model for the BWRX-300 is to be developed using previously approved methodologies used in the ECCS performance analyses for the ESBWR as modified using BWRX-300 specific design requirements and parameters. ~~Full compliance with these requirements is to be demonstrated in the final~~Final ECCS performance analyses are to be completed during future licensing activities using an NRC-approved BWRX-300 ECCS evaluation model. Methodology for containment response is described in ~~a separate~~ LTR NEDC-33911P, BWRX-300 Containment Performance [Reference 5.6].

. . .

4.1.2 10 CFR 50.46

. . .

Based on the above evaluation, the combined design features of the [[ ]] meet the definition of an ECCS as described in 10 CFR 50.46(a)(1)(i) that has a calculated cooling performance following postulated LOCAs in ~~full~~ compliance with the criteria set forth in 10 CFR 50.46(b). In addition, the [[ ]] are effective as an ECCS for breaks in pipes in the RCPB up to and including a break equivalent in size to the double-ended rupture of the largest pipe in the RCS ~~in full compliance~~consistent with the definition of a LOCA in 10 CFR 50.46(c)(1).

Although this is a~~n alternative and~~ non-traditional approach for the design of the ECCS for past LWRs, no [[ ]] is ~~required~~needed following the worst case LOCA to meet the acceptance criteria in 10 CFR 50.46(b). Final ECCS performance analyses are to be completed during future licensing activities. Therefore, ~~no exception or exemption is required for these regulatory requirements. Full compliance with these requirements is to be demonstrated in the final ECCS performance analyses to be completed during future licensing activities.~~the BWRX-300 design will meet the requirements of 10 CFR 50.46.

. . .

Statement of Compliance: The ECCS evaluation model for the BWRX-300 is to be developed using previously approved methodologies used in the ECCS performance analyses for the ESBWR as modified using BWRX-300 specific design requirements and parameters. ~~Full compliance with these requirements is to be demonstrated in the final~~Final ECCS performance analyses are to be completed during future licensing activities using an NRC-approved BWRX-300 ECCS evaluation model. Therefore, ~~no alternative approach, exception, or exemption from these requirements is required~~the BWRX-300 design will meet the requirements of 10 CFR 50.46(a)(1).

. . .

Statement of Compliance: The design goal is that the core does not uncover during LOCAs, and that no significant fuel cladding heatup occurs, such that the calculated maximum fuel element cladding temperature does not exceed the acceptance criterion of 2200°F. ~~Therefore, no alternative approach, exception, or exemption from these requirements is required. Full compliance with this requirement is to be demonstrated in the final~~Final ECCS performance analyses are to be completed during future licensing activities. Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50.46(b)(1).

. . .

Statement of Compliance: The design goal is that the core does not uncover during LOCAs, and that no significant fuel cladding oxidization occurs, such that the calculated total oxidation of the cladding does not nowhere exceed the acceptance criterion of 0.17 times the total cladding thickness before oxidation. ~~Therefore, no alternative approach, exception, or exemption from these requirements is required. Full compliance with this requirement is to be demonstrated in the final~~Final ECCS performance analyses are to be completed during future licensing activities. Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50.46(b)(2).

. . .

Statement of Compliance: The design goal is that the core does not uncover during LOCAs, and that no significant fuel cladding hydrogen generation occurs, such that the calculated total amount of hydrogen generated from the chemical reaction of the cladding with water or steam does not exceed the acceptance criterion of 0.01 times the hypothetical amount that would be generated if

all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react. ~~Therefore, no alternative approach, exception, or exemption from these requirements is required. Full compliance with this requirement is to be demonstrated in the final~~Final ECCS performance analyses are to be completed during future licensing activities. Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50.46(b)(3).

. . .

Statement of Compliance: The design goal is that ~~the core does not uncover during LOCAs, and that~~ no significant changes in core geometry occur, such that the acceptance criterion of the core remaining amenable to cooling is met. ~~Therefore, no alternative approach, exception, or exemption from these requirements is required. Full compliance with this requirement is to be demonstrated in the final~~Final ECCS performance analyses are to be completed during future licensing activities. Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50.46(b)(4).

. . .

Statement of Compliance: The design goal is that the core does not uncover during LOCAs, and that ~~no significant fuel cladding heatup~~long term cooling to remove decay heat and maintain the core temperature to acceptably low values occurs, such that after any calculated successful initial operation of the ECCS, the acceptance criteria of the calculated core temperature being maintained at an acceptably low value and decay heat being removed for the extended period of time required by the long lived radioactivity remaining in the core are met.

For the BWRX-300, [[

]] In addition, the operation of the ICS does not require offsite electric power system operation, and only requires one-time automatic actuation using onsite Class 1E battery-backed power without any further need of onsite or offsite electric power system operation.

The selected long-term cooling timeframe of [[ ]] is sufficient to maintain reactor water level at TAF for both [[

]] Following the worst-case postulated LOCA (i.e., [[ ]]), the [[ ]] continues to provide long-term cooling to meet the requirements of 10 CFR 50.46(b)(5) and only requires operator action to [[ ]] after approximately seven days.

~~Therefore, no alternative approach, exception, or exemption from these requirements is required. Full compliance with this requirement is to be demonstrated in the final~~Final ECCS performance analyses are to be completed during future licensing activities. Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50.46(b)(5).

. . .

4.1.3 10 CFR 50.55a

. . .

These requirements are to be implemented during detailed design of the safety-related components of the [[ ]]. ~~Full compliance with these requirements is to be demonstrated in the preliminary and final design of the BWRX-300 to be completed during future licensing activities.~~

Therefore, ~~no alternative approach, exception, or exemption from these requirements is required~~the BWRX-300 design will meet the requirements of 10 CFR 50.55a.

. . .

4.1.4 10 CFR 50 Appendix A, GDC 1

. . .

~~Full compliance with these requirements is to be demonstrated in the preliminary and final design of the BWRX-300 to be completed during future licensing activities.~~

Therefore, ~~no alternative approach, exception, or exemption from these requirements is required~~the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 1.

. . .

~~4.1.5~~4.1.6 10 CFR 50 Appendix A, GDC 4

. . .

Therefore, ~~no alternative approach, exception, or exemption from these requirements is required~~the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 4.

. . .

~~4.1.6~~4.1.7 10 CFR 50 Appendix A, GDC 14

. . .

This results in an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture, in ~~full~~ compliance with this criterion. For piping that have [[

]]. Further design details are to be described during future licensing activities.

Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 14.

. . .

~~4.1.7~~4.1.8 10 CFR 50 Appendix A, GDC 15

. . .

The combination of RPS and [[ ]] design features ensure that the acceptance criteria for each component in the protected system are met including 1) the overpressure does not exceed 1.1 times design pressure for the expected system pressure transient condition, and 2) the calculated stress intensity and other design limitations for Service Level C are not exceeded for the unexpected system excess pressure transient condition, with further design details to be described during future licensing activities. ~~Full compliance with these requirements is to be demonstrated in the preliminary and final design of the BWRX-300 to be completed during future licensing activities.~~

Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 15.

. . .

~~4.1.8~~4.1.9 10 CFR 50 Appendix A, GDC 30

. . .

In addition, means are to be provided to detect and identify the location of the source of reactor coolant leakage, including the components of the ICS and RPV isolation valves, for components of the RCPB, with further design details to be described during future licensing activities. ~~Full compliance with these requirements is to be demonstrated in the preliminary and final design of the BWRX-300 to be completed during future licensing activities.~~

Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 30.

. . .

~~4.1.9~~4.1.10 10 CFR 50 Appendix A, GDC 31

. . .

The components of the RCPB, including the ICS and RPV isolation valves, are to be designed with sufficient margin to assure that these requirements are met, with further design details to be described during future licensing activities. ~~Full compliance with these requirements is to be demonstrated in the preliminary and final design of the BWRX-300 to be completed during future licensing activities.~~

Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 31.

. . .

~~4.1.11~~4.1.12 10 CFR 50 Appendix A, GDC 35

. . .

As previously described, the combined design features of the [[ ]] meet the as described in 10 CFR 50.46(a)(1)(i) that has a calculated cooling performance following postulated LOCAs in ~~full~~ compliance with the criteria set forth in 10 CFR 50.46(b). In addition, the [[ ]] are effective as an ECCS for breaks in pipes in the RCPB up to and including a break equivalent in size to the double-ended rupture of the largest pipe in the RCS in ~~full~~ compliance with the definition of a LOCA in 10 CFR 50.46(c)(1).

. . .

~~Full compliance with these requirements is to be demonstrated in the final ECCS performance~~The analyses to ~~be completed~~demonstrate compliance will be provided during future licensing activities.

Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 35.

. . .

4.2.1 Regulatory Guide 1.26

. . .

Therefore, the BWRX-300 design conforms to the guidance for the RPV isolation valves and the ICS, including regulatory positions of RG 1.26~~, without requiring an alternative approach or exception~~.

. . .

4.2.2 Regulatory Guide 1.29

. . .

Therefore, the BWRX-300 design conforms to the guidance, including regulatory positions of RG 1.29~~, without requiring an alternative approach or exception~~.

. . .

4.2.3 Regulatory Guide 1.45

. . .

Additionally, the means for detecting and, to the extent practical, identifying the location of the source of reactor coolant leakage in compliance with the requirements of 10 CFR 50 Appendix A, GDC 30, and the requirements for in-service inspection and testing of the [[

]]

in compliance with the requirements of 10 CFR 50.55a, are to be demonstrated during future licensing activities~~, and no alternative approach, exception, or exemption from these requirements is required~~.

Therefore, the BWRX-300 design conforms to the guidance, including regulatory positions of RG 1.45~~, without requiring an alternative approach or exception~~.

. . .

4.2.4 Regulatory Guide 1.84

. . .

Compliance with the requirements of 10 CFR 50.55a, including the use of ASME B&PV Section III Code Cases endorsed in RG 1.84 where necessary, is to be demonstrated during future licensing activities~~, and no alternative approach, exception, or exemption from these requirements is required~~.

Therefore, the BWRX-300 design conforms to the guidance, including regulatory positions of RG 1.84~~, without requiring an alternative approach or exception~~.

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Date of eRAI Issue: 04/09/20

NRC Question 03.09.06-7

Section 4.1.6 in NEDC-33910 describes compliance with 10 CFR Part 50, Appendix A, GDC 14 regarding the reactor coolant pressure boundary. This section does not indicate if full compliance with GDC 14 is planned. The NRC staff requests that GEH clarify its compliance with GDC 14.

GEH Response to NRC Question 03.09.06-7

GEH understands that the use of statements such as "full compliance will be demonstrated during future licensing activities" is not appropriate where used. Therefore, the discussion containing those statements are proposed to be revised in NEDC-33910P as described in the response to NRC Question 03.09.06-6. These changes include stating that further design details are to be described in future licensing activities to demonstrate that the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 14.

Proposed Changes to NEDC-33910P, Revision 0

See the changes proposed in response to NRC Question 03.09.06-6.

eRAI No.: 9730
Date of eRAI Issue: 04/09/20

NRC Question 03.09.06-8

Section 4.1.10 in NEDC-33910 describes compliance with the intent of GDC 33 regarding reactor coolant makeup. The NRC staff requests that GEH clarify its statement that the intent of this criterion is met.

GEH Response to NRC Question 03.09.06-8

As stated in NEDC-33910P, 10 CFR 50, Appendix A, GDC 33, Reactor coolant makeup, requires that a system to supply reactor coolant makeup for protection against small breaks in the RCPB shall be provided. The system safety function shall be to assure that specified acceptable fuel design limits are not exceeded as a result of reactor coolant loss due to leakage from the RCPB and rupture of small piping or other small components which are part of the boundary. The system shall be designed to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished using the piping, pumps, and valves used to maintain coolant inventory during normal reactor operation.

For the BWRX-300, [[

]] In addition, the operation of the ICS does not require offsite electric power system operation, and only requires one-time automatic actuation using onsite Class 1E battery-backed power without any further need of onsite or offsite electric power system operation. Further discussion regarding the selected long-term cooling period for the BWRX-300 is included in the GEH response to NRC Question NONE-2 in Enclosures 3 (Proprietary) and 6 (Non-Proprietary).

Because specified acceptable fuel design limits are not exceeded as a result of reactor coolant loss due to leakage from the RCPB and rupture of small piping or other small components which are part of the boundary [[ ]] the special circumstance as specified in 10 CFR 50.12(a)(2)(ii) is present justifying an exemption to these specific requirements of 10 CFR 50 Appendix A, GDC 33. The application of the regulation in these particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. Instead, a new Principal Design Criterion (PDC) 33 is proposed as described in the proposed changes to NEDC-33910P provided below.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to address proposal of a PDC 33 and provide justification for an exemption to these specific requirements of 10 CFR 50 Appendix A, GDC 33, which may be used as the bases for the necessary exemption during future licensing activities either by GEH in support of a 10 CFR 52 DCA or by a license applicant for requesting a CP and OL under 10 CFR 50 or a COL under 10 CFR 52:

. . .

~~4.1.10~~4.1.11 10 CFR 50 Appendix A, GDC 33

. . .

Statement of Compliance: The safety analysis assumes that the small pipe breaks [[

]] In addition, the operation of the ICS does not require offsite electric power system operation, and only requires one-time automatic actuation using onsite Class 1E battery-backed ~~DC~~ power without any further need of onsite or offsite electric power system operation.

~~Although the BWRX-300~~ [[
]] ~~nonsafety-related injection systems may be used for manual addition of reactor coolant inventory by the operator using high pressure CRD injection or by reestablishing feedwater injection. These nonsafety-related injection systems can be used at any time following a LOCA. The timing of such operator actions is to be determined during the final ECCS performance analyses to be completed during future licensing activities.~~ Therefore, specified acceptable fuel design limits are not exceeded as a result of reactor coolant loss due to leakage from the RCPB and rupture of small piping or other small components which are part of the boundary [[

]]. Based on the above discussions, the special circumstance as specified in 10 CFR 50.12(a)(2)(ii) is present justifying an exemption to these specific requirements of 10 CFR 50 Appendix A, GDC 33. The application of the regulation in these particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule. Instead, the following PDC 33 is proposed:

PDC 33, Reactor coolant makeup, a safety-related system to supply reactor coolant makeup for protection against small breaks in the RCPB is not needed to assure that specified acceptable fuel design limits are not exceeded as a result of reactor coolant loss due to leakage from the RCPB and rupture of small piping or other small components which are part of the boundary. In addition, the operation of the systems to mitigate the consequences of small breaks in the RCPB do not require offsite electric power system operation, and only require one-time automatic actuation using onsite Class 1E battery-backed power without any further need of onsite or offsite electric power system operation.

These statements of compliance and proposed PDC 33 may be used as the bases for the necessary exemption during future licensing activities either by GEH in support of a 10 CFR 52 DCA or by a license applicant for requesting a CP and OL under 10 CFR 50 or a COL under 10 CFR 52.

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Date of eRAI Issue: 04/09/20

NRC Question 03.09.06-9

Section 4.1 in NEDC-33910, discussing 10 CFR Part 50 regulations and GDCs, does not mention GDC 2, as it relates to pumps, valves, and dynamic restraints important to safety to withstand the effects of natural phenomena combined with the effects of normal and accident conditions. The NRC staff requests that GEH clarify how GDC 2 will be met.

GEH Response to NRC Question 03.09.06-9

NEDC-33910P did not describe compliance with 10 CFR 50 Appendix A, GDC 2, and will be revised to include this information. The conclusion of this additional information to be provided is that the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 2.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to add the following as new Subsection 4.1.5 to address compliance with 10 CFR 50, Appendix A, GDC 2:

. . .

4.1.5 10 CFR 50 Appendix A, GDC 2

- Regulatory Requirement: 10 CFR 50 Appendix A, GDC 2, Design bases for protection against natural phenomena, requires that SSCs important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

  Statement of Compliance: The BWRX-300 RPV isolation and overpressure protection design features, [[ ]] are to be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. Specific design requirements for the [[ ]] used to verify the capability to perform their safety functions, and the natural phenomena and effects evaluated, will be provided during future licensing activities.

  Therefore, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 2.

eRAI No.: 9730
Date of eRAI Issue: 04/09/20

NRC Question 03.09.06-10

Section 4.1 in NEDC-33910, discussing 10 CFR Part 50 regulations and GDCs, does not mention GDC 54, as it relates to designing piping systems penetration containment with the capability to test periodically the operability of the isolation valves and determine valve leakage acceptability. The NRC staff requests that GEH clarify how GDC 54 will be met.

GEH Response to NRC Question 03.09.06-10

Compliance with the requirements of 10 CFR 50, Appendix A, GDC 54, GDC 55, and GDC 56 as related to the design of the [[ ]] are described in Subsections 5.1.21, 5.1.22 and 5.1.26 of NEDC-33911P, Revision 0, BWRX-300 Containment Performance.

Proposed Changes to NEDC-33910P, Revision 0

None

eRAI No.: 9730
Date of eRAI Issue: 04/09/20

NRC Question 03.09.06-11

Section 4.2 in NEDC-33910, discussing NRC Regulatory Guides (RGs), does not discuss RG 1.147 or RG 1.192, as they relate to the acceptability of Code Cases for the ASME Boiler and Pressure Vessel Code (BPV Code) and ASME Operation and Maintenance of Nuclear Power Plants (OM Code) for inservice inspection and IST activities in satisfying 10 CFR 50.55a, respectively. The NRC staff requests GEH to clarify the intent of the topical report regarding these RGs.

GEH Response to NRC Question 03.09.06-11

NEDC-33910P did not describe conformance to the regulatory guidance of RG 1.147 and RG 1.192 and will be revised to include this information. However, the requirements of ASME B&PV Code Section XI, Division 1, specifically apply during construction and operations activities of nuclear power plants for performance of inservice inspection activities, and the requirements of ASME OM Code specifically apply during operations and maintenance activities of nuclear power plants for performance of inservice testing activities, and do not apply during the design of the BWRX-300. Therefore, the conclusion of this additional information to be provided is that the guidance of RG 1.147 and RG 1.192 do not apply to the BWRX-300 design phase in meeting the requirements of 10 CFR 50.55a.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to add the following as new Subsections 4.2.5 and 4.2.6 to address conformance with the regulatory guidance of RG 1.147 and RG 1.192, respectively:

. . .

4.2.5 Regulatory Guide 1.147

RG 1.147, Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1, Rev. 19, lists the ASME B&PV Section XI Code Cases that the NRC has approved for use as voluntary alternatives to the mandatory ASME B&PV Code provisions that are incorporated by reference into 10 CFR 50. This applies to reactor licensees subject to 10 CFR 50.55a, Codes and Standards. These ASME B&PV Section XI Code Cases are acceptable to the NRC Staff for use in implementing the regulatory requirements of 10 CFR 50 Appendix A, GDC 1, Quality standards and records, and 10 CFR 50 Appendix A, GDC 30, Quality of reactor coolant pressure boundary, and the requirements of 10 CFR 52.79(a)(11) which requires the final safety analysis report to include "a description of the program(s), and their implementation, necessary to ensure that the systems and components meet the requirements of the ASME Boiler and Pressure Vessel Code and the ASME Code for Operation and Maintenance of Nuclear Power Plants in accordance with 50.55a of this chapter." In 10 CFR 50.55a(a)(1)(ii), the NRC references the latest editions and addenda of ASME B&PV Code Section XI that the agency has approved for use.

Section 4.1.3 describes how the design of the RCPB, including the ICS and RPV isolation valves, complies with the requirements of 10 CFR 50.55a. However, the requirements of ASME B&PV Code Section XI, Division 1, specifically apply during construction and operation activities of nuclear power plants for performance of inservice inspection activities, and do not apply during the design of the BWRX-300. Therefore, compliance with the requirements of 10 CFR 50.55a for the conduct of ISI activities, including the use of ASME B&PV Section XI Code Cases endorsed in RG 1.147 where necessary, is to be demonstrated during future licensing activities.

Based on this discussion, the guidance of RG 1.147 does not apply to the BWRX-300 design phase in meeting the requirements of 10 CFR 50.55a.

4.2.6 Regulatory Guide 1.192

RG 1.192, Operation and Maintenance Code Case Acceptability, ASME OM Code, Rev. 3, lists Code Cases associated with the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code) that the NRC has approved for use as voluntary alternatives to the mandatory ASME OM Code provisions that are incorporated by reference into 10 CFR 50. This applies to reactor licensees subject to 10 CFR 50.55a, Codes and Standards. These ASME OM Code Cases are acceptable to the NRC Staff for use in implementing the regulatory requirements of 10 CFR 50 Appendix A, GDC 1, Quality standards and records, and 10 CFR 50 Appendix A, GDC 30, Quality of reactor coolant pressure boundary, the requirements of 10 CFR 50.55a(f) which requires, in part, that Class 1, 2, and 3 components and their supports meet the requirements of the ASME OM Code or equivalent quality standards, and the requirements of 10 CFR 52.79(a)(11) which requires the final safety analysis report to include "a description of the program(s), and their implementation, necessary to ensure that the systems and components meet the requirements of the ASME Boiler and Pressure Vessel Code and the ASME Code for Operation and Maintenance of Nuclear Power Plants in accordance with 50.55a of this chapter." In 10 CFR 50.55a(a)(1)(iv), the NRC references the latest editions and addenda of ASME OM Code that the agency has approved for use.

Section 4.1.3 describes how the design of the RCPB, including the ICS and RPV isolation valves, complies with the requirements of 10 CFR 50.55a. However, the requirements of ASME OM Code specifically apply during operation and maintenance activities of nuclear power plants for performance of IST activities, and do not apply during the design of the BWRX-300. Therefore, compliance with the requirements of 10 CFR 50.55a for the conduct of IST activities, including the use of ASME OM Code Cases endorsed in RG 1.192 where necessary, is to be demonstrated during future licensing activities.

Based on this discussion, the guidance of RG 1.192 does not apply to the BWRX-300 design phase in meeting the requirements of 10 CFR 50.55a.

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Date of eRAI Issue: 04/09/20

NRC Question 03.09.06-12

Section 4.3 in NEDC-33910, discussing NUREG-0800 Standard Review Plan (SRP), does not mention SRP Section 3.9.6, as it relates to the functional design, qualification, and IST programs for pumps, valves, and dynamic restraints. The NRC staff requests GEH to clarify the intent of the topical report regarding SRP Section 3.9.6.

GEH Response to NRC Question 03.09.06-12

NEDC-33910P did not describe conformance to the regulatory guidance of SRP 3.9.6 and will be revised to include this information. The BWRX-300 RPV isolation valves and overpressure protection design features are to be designed using the standards approved in 10 CFR 50.55a(a) in effect within six months of any license application, including any application for a construction permit under 10 CFR 50 or design certification application under 10 CFR 52. These requirements are to be implemented during detailed design of the safety-related components of the [[ ]]. Therefore, the conclusion of this additional information to be provided is that the existing SRP provides adequate guidance to use during future review of a BWRX-300 10 CFR 52 design certification application if pursued (as required by 10 CFR 52.47(a)(9)), or for future 10 CFR 50 license applications.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to add the following as new Subsection 4.3.1 to address conformance with the regulatory guidance of SRP 3.9.6:

. . .

4.3.1 Standard Review Plan 3.9.6

Standard Review Plan (SRP) 3.9.6, Functional Design, Qualification, and Inservice Testing Programs for Pumps, Valves, and Dynamic Restraints, Rev. 4, states that the areas of review include the functional design and qualification provisions and IST programs for safety-related pumps, valves, and dynamic restraints (snubbers) designated as Class 1, 2, or 3 under ASME B&PV Code Section III.

As described in Section 4.1, the BWRX-300 design will meet the requirements of 10 CFR 50 Appendix A, GDC 1, GDC 2, GDC 4, GDC 14, GDC 15, and GDC 37, with specific requirements for the [[ ]] to be provided during future licensing activities. In addition, Section 4.1.3 describes that the BWRX-300 RPV isolation valves and overpressure protection design features are to be designed using the standards approved in 10 CFR 50.55a(a) in effect within six months of any license application, including any application for a construction permit under 10 CFR 50 or design certification application under 10 CFR 52.the requirements of 10 CFR 50.55a, during detailed design activities. These requirements are to be implemented during detailed design of the safety-related components of the [[

]]. Therefore, the existing SRP provides adequate guidance to use during future review of a BWRX-300 10 CFR 52 design certification application if pursued (as required by 10 CFR 52.47(a)(9)), or for future 10 CFR 50 license applications.

eRAI No.: 9730
Date of eRAI Issue: 04/09/20

NRC Question 03.09.06-13

Sections 4.4 and 4.5 in NEDC-33910 refer to generic issues, and operational experience and generic communications, respectively, applicable to the BWRX-300 nuclear power plant. This section only discusses two items with respect to these topics. The NRC staff requests that GEH indicate whether it will provide an up-to-date evaluation of generic issues, and operational experience and generic communications, during future licensing activities under 10 CFR Part 50 or Part 52.

GEH Response to NRC Question 03.09.06-13

Sections 4.4 and 4.5 of NEDC-33910P do not represent the total listing required to support a 10 CFR 52 design certification application if pursued or for future 10 CFR 50 license applications and are provided based on their relevance to the scope of this LTR. Therefore, NEDC-33910P will be revised to include a discussion in each section identifying the limited scope of this evaluation, and committing to the up-to-date evaluation of these issues to be provided during future licensing activities in support of a BWRX-300 10 CFR 52 design certification application or for future 10 CFR 50 license applications.

Proposed Changes to NEDC-33910P, Revision 0

NEDC-33910P, Revision 0, will be revised to include the following changes to Sections 4.4 and 4.5 identifying the limited scope of this evaluation, and committing to the up-to-date evaluation of these issues to be provided during future licensing activities:

. . .

4.4 Generic Issues

The following generic issues provided are based on their relevance to the scope of this LTR, and an up-to-date evaluation of generic issues is to be provided during future licensing activities either by GEH in support of a 10 CFR 52 DCA or by a license applicant for requesting a CP and OL under 10 CFR 50 or a COL under 10 CFR 52.

. . .

4.5 Operational Experience and Generic Communications

The operational experience and generic communications provided are based on their relevance to the scope of this LTR, and an up-to-date evaluation of operational experience and generic communications is to be provided during future licensing activities either by GEH in support of a 10 CFR 52 DCA or by a license applicant for requesting a CP and OL under 10 CFR 50 or a COL under 10 CFR 52.

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NRC Question 03.09.06-14

In referring to specific NRC regulations, NEDC-33910 indicates in several instances that full compliance will be demonstrated during future licensing activities. The NRC staff requests that GEH clarify the intent of this statement and indicate its plans to fully comply with specific NRC regulations.

GEH Response to NRC Question 03.09.06-14

GEH understands that the use of statements such as "full compliance will be demonstrated during future licensing activities" is not appropriate where used. Therefore, the discussion containing those statements are proposed to be revised in NEDC-33910P as described in the response to NRC Question 03.09.06-6.

Proposed Changes to NEDC-33910P, Revision 0

See the changes proposed in response to NRC Question 03.09.06-6.