**From:** Franovich, Rani
**Sent:** Thursday, April 9, 2020 5:07 PM
**To:** GEH-BWRX-300RAIsPEm Resource
**Subject:** NEDC-33910P, "BWRX-300 Reactor Pressure Vessel Isolation and Overpressure Protection," Request for Additional Information 9372
**Attachments:** Letter 3 RAI_9732 Public.pdf

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# Request for Additional Information 9732

Issue Date: 04/09/2020
Application Title: GEH BWRX-300 Topical Reports
Operating Company: GE Hitachi Nuclear Energy (Wilmington, NC)
Docket No. 99900003
Review Section: NONE - NO SRP SECTION
Application Section:

QUESTIONS

NONE-1

10 CFR 50, Appendix A, General Design Criteria (GDC) 33 requires that a system to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary shall be provided. Specifically, it states, "[t]he 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 reactor coolant pressure boundary 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."

Licensing Topical Report (LTR) NEDC-33910P, Revision 0, "BWRX-300 Reactor Pressure Vessel Isolation and Overpressure Protection," Section 4.1.10, states that {{ }} and concludes {{ }}. In addition, it states "nonsafety-related injection systems may be used for manual addition of reactor coolant inventory by the operator using high-pressure CRD [control rod drive] 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."

i) The NRC staff understands that in some cases GEH believes that regulations are not applicable or can be satisfied by meeting the intent of the regulation. The requirement of GDC 33 appears to be applicable to the BWRX-300 design; however, to the extent GEH can show that the requirement is not necessary to meet the underlying purpose of the regulation, that showing would appear to address the "special circumstances" required to justify an exemption from the regulation under 10 CFR 50.12. The NRC staff notes that GDC 33 requires makeup provisions for both emergency and normal operating conditions. Therefore, the NRC staff requests GEH to clarify the method by which it plans to satisfy GDC 33 for the BWRX-300 design. In addition, the NRC staff requests GEH to indicate if it plans to develop a principle design criterion to address the design-specific nature by which the intent of GDC 33 will be satisfied.

ii) As noted above, LTR NEDC-33910 states that nonsafety-related systems may be used by operators, and the timing of such actions will be determined later. The NRC staff infers that GEH plans to credit nonsafety-related systems to mitigate the effects of small breaks in the reactor coolant system (RCS) pressure boundary, which is non-conforming to regulatory requirements. The staff requests GEH clarify its statements regarding the use and crediting of nonsafety-related systems following a LOCA or other small breaks in the RCS.

NONE-2

10 CFR 50.46, Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors, requires that "Each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section." The criteria in paragraph (b) include peak cladding temperature, maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long-term cooling with associated limits included in the regulation. Moreover, each criterion is quantitatively defined.

Licensing Topical Report (LTR) NEDC-33910P, Revision 0, "BWRX-300 Reactor Pressure Vessel Isolation and Overpressure Protection," Section 2.8, states that:

The primary design goal of the BWRX-300 in response to a LOCA is that the core does not uncover so that the following acceptance criteria are met:

- No significant fuel cladding heat up shall occur.
- No significant fuel cladding oxidization shall occur.
- No significant fuel cladding hydrogen generation shall occur.
- Long-term cooling shall remove decay heat and maintain core temperature to acceptably low values.

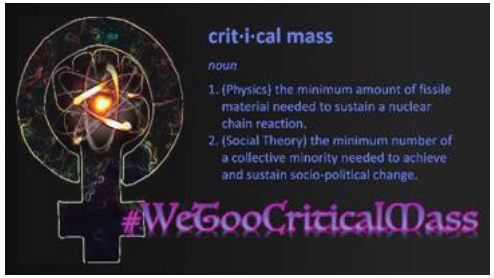
These criteria lack definition and, as such, are subject to interpretation. The staff requests that GEH clarify whether it intends is to use and more explicitly define the criteria currently outlined in Section 2.8 as acceptance criteria in future licensing of the BWRX-300 design, or if GEH intends to use the criteria contained and explicitly defined in 10 CFR 50.46(b).

NONE-3

10 CFR 50.46(b)(5), requires the calculated core temperature to be maintained at an acceptably low value and decay heat to be removed for the extended period of time required by the long-lived radioactivity remaining in the core. 10 CFR 50, Appendix A, GDC 35 requires a system to provide abundant emergency core cooling. In addition, the 2008 Advanced Reactor Policy Statement (73 FRN 60612) describes the Commission's expectation for new reactors' safety systems to provide enhanced margins of safety and/or use simplified, inherent, passive, or other innovative means to accomplish their safety functions (e.g. longer time constants and reduced operator actions).

One of the principle design requirements of the Electric Power Research Institute's (EPRI) Advanced Light Water Reactor (ALWR) Utility Requirements Document (URD) for passive designs is that the core must be cooled and containment integrity maintained with only safety-related SSCs and without reliance on ac power and operator actions for a minimum of 72 hours. The staff concludes in its corresponding safety evaluation (NUREG-1242, Vol. 3, Pt.1) that these requirements relative to the 72-hour capability are acceptable and are consistent with Commission policies related to passive designs.

Licensing Topical Report NEDC-33910P, specifies that adequate core cooling is maintained {{ }}, and the {{ }} will be used to ensure full compliance with 10 CFR 50.46(b)(5), and GDC 35. However, it is unclear to the staff what long-term cooling timeframe will be established for the BWRX-300, and when water injection from nonsafety-related sources will be used by the operators after the design-basis long-term cooling period. Therefore, the staff requests GEH to define the design-basis long-term cooling timeframe for the BWRX-300 (e.g. 72 hours, 7 days, etc.) or ensure Licensing Topical Report NEDC-33910P clearly describes where it will be addressed in future submittals.


crit·i·cal mass
noun
1. (Physics) the minimum amount of fissile material needed to sustain a nuclear chain reaction.
2. (Social Theory) the minimum number of a collective minority needed to achieve and sustain socio-political change.
#WeTooCriticalMass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