

7.0 Instrumentation and Control Systems

7.4.1.4.4 Shutdown Panel

7.4.1.4.4.1 Regulatory Criteria

In the GE-Hitachi Nuclear Energy (GEH), Advanced Boiling-Water Reactor (ABWR) Design Control Document (DCD) Revision 6, GEH (the applicant) proposed a design change to include additional controls and indications on the ABWR Remote Shutdown Panel. These additional controls and indications improve the diversity and defense in depth during beyond design-basis events and could provide a potential Combined License (COL) applicant the means for meeting the proposed Title 10 *Code of Federal Regulations* (10 CFR) 50.155, "Mitigation of Beyond-Design Basis Events," rule.

In a letter dated July 20, 2012 (Agencywide Documents Access and Management Systems (ADAMS) Accession No. ML12125A385), the U. S. Nuclear Regulatory Commission (NRC) staff identified 28 items for GEH's consideration as part of its application to renew the ABWR Design Certification (DC). The applicant was requested by the staff in Item No. 26, of the July 20, 2012, staff letter to address ABWR DCD design changes related to aspects of the NRC Fukushima Near Term Task Force Recommendation 4.2 regarding mitigation strategies for beyond-design-basis external events based on the NRC policy at that time outlined in a Staff Requirements Memorandum SECY-12-0025, "Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," dated February 17, 2012 (ADAMS Accession No. ML12039A111).

In a letter dated January 23, 2017 (ADAMS Accession No. ML17025A386), GEH provided supplemental information for GEH's response to Item 26 of the NRC suggested ABWR design changes for consideration as part of their application to renew the ABWR DC. The applicant narrowed the scope of Item No. 26 to exclude changes directly related to SECY-12-0025, pending final rulemaking for the Mitigation of Beyond-Design Basis Events (MBDBE) rule. As such, GEH retained the related design change of additional controls and indications for the ABWR Remote Shutdown Panel as an operational enhancement to provide additional defense in depth. These proposed ABWR design enhancements could provide a potential COL applicant the means for meeting the MBDBE rule requirements of 10 CFR 50.155.

These proposed changes do not fall within the definition of a "modification." Therefore, in accordance with 10 CFR 52.59(c), these design changes are "amendments," as this term is defined in Chapter 1 of this supplement and will correspondingly be evaluated using the regulations in effect at renewal. The applicable regulatory requirements for evaluating the proposed DCD design amendments to add additional controls and indications to the ABWR Remote Shutdown Panel are as follows:

GDC 19, "Control Room," requires, in part, that equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.

7.4.1.4.4.2 *Summary of Technical Information*

Item 26 from the staff letter dated July 20, 2012, requested that the applicant address the design related aspects of Fukushima Recommendation 4.2 regarding mitigation strategies for beyond-design-basis external events as outlined in Attachment 2 of the Commission Order EA-12-049 (ADAMS Accession No. ML12054A735), "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," issued on March 12, 2012.

Recent NRC actions involving a pending final rulemaking for the MBDBE rule, were discussed during a public teleconference held December 1, 2016. Under the latest public information regarding the pending final rule, there will be no requirements applicable to applicants for a standard design certification (or a renewal, as in the case of the ABWR application). It is expected that the final rule will be effective before the ABWR design certification renewal would be completed. On that basis, in a letter dated December 6, 2016, GEH informed the NRC of its plans to submit a revised response for addressing Item 26 by the end of January 2017. By letter dated January 23, 2017 (ADAMS Accession No. ML17025A386), the applicant provided the updated GEH response for Item 26, maintaining some enhanced design features related to mitigating strategies that may be used by a potential COL applicant to satisfy the eventual MBDBE rule requirements including enhancements to the ABWR Remote Shutdown Panel.

7.4.1.4.4.3 *Technical Evaluation*

In a letter dated January 23, 2017, the applicant stated the ABWR design enhancements that are proposed provide additional features, rather than addressing specific regulatory requirements, that, for example, provide redundancy or offer operational conveniences that have been proposed by the industry. The features may be used as part of an overall approach for mitigating strategies when COL applicants or licensees implement the pending final MBDBE rule for development of procedures, or programs. For these reasons, GEH has elected to retain most of these design features in the DCD but will not characterize them as "mitigating strategies."

The design enhancements the applicant proposed for the ABWR Remote Shutdown System include:

- Replacement of control for safety relief valves (SRVs) "G", "J", "K" and "P" with control for Automatic Depressurization System (ADS) SRVs "C", "H", "L" and "R", which can be operated by the replenishable supply of nitrogen gas (N₂). This change affects DCD Sections: Tier 1, Figure 2.1.2a, Tier 2, Figure 7.3-2, Sheets 2, 3, 4, 6, 7, 9, 10 and 18, Figure 7.4-2, Figure 7.4.3, Sheets 2 and 9.
- Addition of Wide Range Reactor Pressure Vessel (RPV) Water Level indication (Division I and II) (Cold Calibration) to provide capability to monitor this parameter from a centralized location during extended loss of alternating current (ac) power events. This change affects DCD Sections: Tier 1, Figure 2.1.2e, Tier 2, Sections 7.4.1.4.4, 16.3.3.6.2, 16.B.3.3.6.2, Figure 5.1-3, Sheets 5 and 6, and Figure 7.4-2.
- Addition of N₂ Supply Header Pressure indication (Division I and II) to provide capability to monitor this parameter from a centralized location during extended loss of ac power events. This change affects DCD sections: Tier 1, Sections 2.2.6, 2.11.13, and

Figure 2.2.6, Tier 2, Sections 7.4.1.4.4, 16.3.3.6.2, 16.B.3.3.6.2, Figure 6.7-1, and Figure 7.4-2.

- Addition of Condensate Storage Tank (CST) Water Level indication (Division I which will be in addition to the existing Division II) to provide capability to monitor this parameter from a centralized location during extended loss of ac power events. This change affects DCD Sections: Tier 1, Figure 2.11.2, and Figure 2.2.6, Tier 2, Sections 7.4.1.4.4, 16.3.3.6.2, 16.B.3.3.6.2, Figure 6.7-1, Figure 7.4-2, and Figure 9.2-4.
- Addition of Containment Wide Range Pressure indication (Division I and II) to provide capability to monitor this parameter from a centralized location during extended loss of ac power events. This change affects DCD Sections: Tier 1, Figure 2.2.6, Tier 2, Sections 7.4.1.4.4, 16.3.3.6.2, 16.B.3.3.6.2, Figure 6.2-39, Sheet 3, and Figure 7.4-2.
- Addition of Wide Range Suppression Pool Water Level indication (Division I and II) to provide capability to monitor this parameter from a centralized location during extended loss of ac power events. This change affects DCD Sections: Tier 2, Sections 7.4.1.4.4, 16.3.3.6.2, 16.B.3.3.6.2, Figure 6.2-39, Sheet 2, and Figure 7.4-2.

The applicant stated that these proposed Shutdown Panel design changes will provide enhancements and additional capability for plant operation during control room evacuation as well as beyond design basis event conditions. The capability to operate SRVs assigned to ADS valves, that include a replenishable supply of N₂ for motive force would enable operation of the ADS SRVs from the remote shutdown panels during extended loss of ac power events such as a beyond design basis station black out (SBO) event.

The staff finds that these design changes are enhancements to the ABWR as stated by the applicant and does not affect the staff's evaluation findings documented in the ABWR Section 7.4.3 of final safety evaluation report (FSER), NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design, Main Report," (ADAMS Accession No. ML080670560), for certification of the ABWR design. Specifically, the staff finding that, "Equipment at appropriate locations outside the control room have been provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures" remains valid for the amendments proposed. Therefore, the staff concludes that the systems controlled from the ABWR Remote Shutdown Program required for safe shutdown satisfy the requirements of GDC 19 for capability of a prompt hot shutdown and potential capability for subsequent cold shutdown.

The staff verified that the proposed changes to the DCD discussed above have been presented and depicted in the applicant's January 23, 2017 letter, Enclosure 2, DCD Revision 6 markups. These proposed DCD Revision 7 changes are being tracked as a **Confirmatory Item 7.4.1.4.4-1**.

7.4.1.4.4.4 Conclusion

The staff reviewed the proposed GEH design enhancements that were evaluated as DCD amendments as described in the GEH January 23, 2017 letter, Enclosure 1, Table 1, Items 6 through 11, and determined them to be acceptable ABWR DCD amendments because the proposed changes to the ABWR Remote Shut Down System design features allow for enhanced plant shutdown capabilities from the remote shutdown panels in a beyond design basis event such as during an extended loss of ac power. These enhanced remote shutdown system design features do not affect the staff's evaluation findings documented in Section 7.4.3 of FSER NUREG-1503 for certification of the ABWR design, specifically, the finding that "Equipment at appropriate locations outside the control room have been provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures." Therefore, the staff concludes that the systems required for safe shutdown satisfy the requirements of GDC 19 and are therefore acceptable. Inclusion of the proposed changes in Revision 7 of the DCD is being tracked by **Confirmatory Item 7.4.1.4.4-1** discussed above.