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## 9 AUXILIARY SYSTEMS

Appendix A, "Design Certification Rule for the U.S. Advanced Boiling Water Reactor," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," constitutes the standard design certification (DC) for the U.S. Advanced Boiling Water Reactor (ABWR) design. To document the U.S. Nuclear Regulatory Commission (NRC) staff's review supporting initial certification of the ABWR, the staff issued a final safety evaluation report (FSER) in NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design," in July 1994 and NUREG-1503, Supplement 1, in May 1997.

The staff is documenting its review of the GE-Hitachi Nuclear Energy (GEH or the applicant) application for renewal of the ABWR DC in Supplement 2 to NUREG-1503. Chapter 1 of this supplemental FSER describes the staff's review process for the ABWR DC renewal. This supplemental FSER section documents the NRC staff's review specifically related to Chapter 9, "Auxiliary Systems," Section 9.1.4, "Light Load Handling System (Related to Refueling)," of the GEH Design Control Document (DCD), Revision 7. Except as modified by this supplement to the FSER, the findings made in NUREG-1503 and its Supplement 1 remain in full effect.

### 9.1.4 Light Load Handling System (Related to Refueling)

#### 9.1.4.1 Regulatory Criteria

In this supplemental FSER section the staff reviewed and evaluated the ABWR DC renewal applicant's changes to the light load-handling system (LLHS) for the GEH ABWR design. The LLHS provides the means of transporting, handling, and storing fuel (both new and spent fuel) in the reactor building.

A combined license (COL) applicant that references the renewed ABWR DC will incorporate the ABWR LLHS as specified by the ABWR DCD, Revision 7, for the safe handling of new and spent fuel from the time it reaches the plant until it leaves the plant after post-irradiation cooling.

In ABWR DCD, Revision 6, GEH revised the ABWR DCD to eliminate the use of the new fuel storage vault (NFSV) and its new fuel storage racks. This design change will result in the ABWR utilizing the spent fuel pool (SFP) for storage of new fuel prior to loading into the reactor. The change to the DCD LLHS to remove the NFSV does not fall within the definition of a "modification." Therefore, in accordance with 10 CFR 52.59(c), this design change is an "amendment," as this term is defined in Chapter 1 of this FSER supplement and will correspondingly be evaluated using the regulations in effect at renewal.

The relevant requirements for this area of review and the associated acceptance criteria are given in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," (SRP) Section 9.1.4, "Light Load Handling System and Refueling Cavity Design," Revision 4, issued July 2014, as summarized below:

- 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," (GDC) 2, "Design Bases for Protection Against Natural Phenomena," as it relates to structures housing the system, and the system itself, being capable of withstanding the effects of earthquakes;

- GDC 61, “Fuel Storage and Handling and Radioactivity Control,” as it relates to radioactivity release as a result of fuel damage, and the avoidance of excessive personnel radiation exposure;
- GDC 62, “Prevention of Criticality in Fuel Storage and Handling,” as it relates to prevention of inadvertent criticality;
- 10 CFR 52.47(b)(1), which requires that a DC application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the DC has been constructed and will be operated in accordance with the DC, the provisions of the Atomic Energy Act of 1954, as amended, and the NRC’s rules and regulations.

#### 9.1.4.2 *Summary of Technical Information*

GEH submitted the ABWR DCD, Revision 5, as part of its DC renewal application in 2010. There was no difference between ABWR DCD Revision 5 and Revision 4 of DCD Tier 2 Section 9.1.4, approved as part of the ABWR DC rule in 1997 (10 CFR Part 52, Appendix A).

In ABWR DCD, Revision 6, submitted by the applicant in 2016, GEH proposed to eliminate the NFSV. Therefore, the racks in the SPF will be utilized for storage of new fuel prior to loading into the reactor. The elimination of the NFSV was evaluated by the staff in Section 9.1.1, “New Fuel Storage,” of this supplemental FSER. This design change generated conforming changes in the following ABWR DCD Sections:

- DCD Tier 1, Section 2.15.3 “Cranes and Hoists”, is revised to eliminate references to the new fuel storage vault and references to dry storage of new fuel, which was to be done in the new fuel storage vault.
- DCD Tier 2, Section 9.1.4 “Light Load Handling System (Related to Refueling),” the applicant revised the process of receiving and handling of new fuel assemblies to eliminate any step that stores new fuel into the new fuel vault or make reference to the new fuel racks or new fuel storage vault.

#### 9.1.4.3 *Technical Evaluation*

The staff evaluated the ABWR LLHS related to the ABWR SFP as part of the initially certified ABWR DC and it was found acceptable for handling new and spent fuel assemblies. Therefore, the staff did not re-evaluate the ABWR LLHS as part of the ABWR renewal review.

The ABWR DCD design changes include the revision of DCD Tier 1, Section 2.15.3 and DCD Tier 2, Section 9.1.4, in order to remove references to the NFSV and its associated storage racks, and to clearly indicate that the SFP is the only storage location for new fuel assemblies.

By eliminating the NFSV, the applicant has not altered the new fuel transportation path, previously reviewed as part of the initial ABWR DC, from receiving to loading new fuel in the SFP. The original design included the option to put new fuel in the NFSV prior to moving it to the SFP, but the applicant proposed to eliminate this option as part of its ABWR DCD,

Revision 6, submittal. The staff finds that this change does not introduce a new accident scenario to those previously evaluated, and it does not impact the safety conclusion that the staff has previously reached in the FSER for the initially certified design as documented in NUREG-1503.

#### *9.1.1.4 Conclusion*

Based on the evaluation provided in this section of the FSER supplement for the ABWR DC renewal, the staff concludes that the design change to remove the NFSV and the change to the LLHS related to new and spent fuel handling as documented in the ABWR DCD, Revision 6 and as reflected in the ABWR DCD, Revision 7, to address the elimination of the option to use the NFSV does not alter the staff's safety findings in NUREG-1503. Therefore, this ABWR design change meets all applicable regulatory requirements in GDC 2, GDC 61, GDC 62, and 10 CFR 52.47(b)(1), as reviewed by the staff in accordance with the associated acceptance criteria in NUREG-800, Section 9.1.4, Revision 4.

## References

1. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants."
2. 10 CFR Part 50, Appendix A, GDC 2, "Design Bases for Protection Against Natural Phenomena."
3. 10 CFR Part 50, Appendix A, GDC 61, "Fuel Storage and Handling and Radioactivity Control."
4. 10 CFR Part 50, Appendix A, GDC 62, "Prevention of Criticality In Fuel Storage and Handling."
5. 10 CFR Part 52, Appendix A, "Design Certification Rule for the U.S. Advanced Boiling Water Reactor." 10 CFR 52.47, "Contents of Applications; Technical Information."
6. 10 CFR 52.59, "Criteria for Renewal."
7. NRC, NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design," July 1994 (ADAMS Accession No. ML080670592).
8. NRC, NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design," Supplement 1, May 1997 (ADAMS Accession No. ML080710134).
9. NRC, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 9.1.4, Revision 4, "Light Load Handling System and Refueling Cavity Design," July 2014 (ADAMS Accession No. ML13318A923).
10. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 5, Tier 1 and Tier 2, December 2010 (ADAMS Accession No. ML110040323).
11. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 6, Tier 1 and Tier 2, February 2016 (ADAMS Accession No. ML16214A015).
12. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 7, Tier 1 and Tier 2, December 2019 (ADAMS Accession No. ML20007E371).