

## **9 AUXILIARY SYSTEMS**

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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. Documenting 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 NRC 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 9.1.1, "New Fuel Storage," 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.

### **9.1.1 New Fuel Storage**

#### **9.1.1.1 Regulatory Criteria**

In this section the staff reviews and evaluates the applicant's changes with regard to new fuel storage and handling for the GEH ABWR design in the ABWR DCD, Revision 7. A combined license (COL) applicant that references the GEH ABWR DC will incorporate the new fuel handling storage requirements and will implement the applicable ABWR procedures to address regulatory requirements for new fuel storage and handling.

In DCD Tier 2, Section 9.1, "Fuel Storage and Handling," approved as part of the ABWR DC rule in 1997 (10 CFR Part 52, Appendix A), onsite underwater storage of spent fuel assemblies and new fuel assemblies is provided by the spent fuel pool (SFP). The SFP fuel racks ensure that stored fuel is maintained in a suitable geometry to prevent criticality and provide cooling for all evaluated design conditions. In order to facilitate handling during fuel inspection and preparation, new fuel assemblies could also be safely stored as close as practicable to the spent-fuel storage pool work area, which is located in the new fuel storage vault (NFSV) in the reactor building.

In ABWR DCD, Revision 6, GEH proposed to revise the ABWR DCD to eliminate the use of the NFSV for the storage of new fuel assemblies. This change will result in the ABWR utilizing the SFP for the storage of new fuel prior to loading into the reactor. The SFP racks were previously evaluated by staff and found acceptable for storage of new fuel assemblies as part of the initial ABWR DC and, therefore, is not evaluated as part of the ABWR renewal review.

The applicant's proposal 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 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 in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," (SRP), Section 9.1.2, "New and Spent Fuel Storage," Revision 4, issued March 2007, as summarized below:

- 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena," as it relates to the ability of structures housing the facility and the facility itself to withstand the effects of natural phenomena such as earthquakes;
- GDC 4, "Environmental and Dynamic Effects Design Bases," as it relates to the structures housing the facility and the facility itself withstanding the effects of environmental conditions, externally-generated missiles, internally-generated missiles, pipe whip, and jet impingement forces of pipe breaks so safety functions are not precluded;
- GDC 61, "Fuel Storage and Handling and Radioactivity Control," as it relates to the facility design for fuel storage and handling of radioactive materials;
- GDC 63, "Monitoring Fuel and Waste Storage," as it relates to monitoring systems for detecting conditions that could cause the loss of decay heat removal capabilities for spent fuel assemblies, detecting excessive radiation levels, and initiating appropriate safety actions;
- 10 CFR 20.1101(b) as it relates to keeping radiation doses as low as reasonably achievable (ALARA);
- 10 CFR 50.68, "Criticality Accident Requirements," as it relates to criticality monitoring or design to preclude criticality accidents; and
- 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.

#### *9.1.1.2 Summary of Technical Information*

ABWR DCD, Revision 5, was submitted as part of the GEH DC renewal application in December 2010. There is no difference between Revision 5 and Revision 4 of DCD Tier 2, Section 9.1 approved as part of the ABWR DC rule.

In ABWR DCD, Revision 6, the applicant proposed to eliminate the NFSV. The SFP will be utilized for storage of new fuel prior to loading into the reactor. This change generated a large number of conforming changes in DCD Tier 2, Section 9.1.

#### *9.1.1.3 Technical Evaluation*

The ABWR design change in ABWR DCD, Revision 7, includes the revision of ABWR DCD Tier 2, Section 9.1, in order to remove references to the NFSV and the associated new fuel storage racks from the ABWR design.

The staff reviewed all the changes related to the removal of the NFSV and racks. The certified design already allowed for new fuel to be moved directly from receipt inspection to the SFP for storage before use in the reactor vessel. Therefore, in this FSER supplement, the staff did not review the capability of the SFP to store new fuel assemblies.

By eliminating the NFSV the applicant did not alter the new fuel handling path from receiving to loading in the vessel. In addition, the staff finds that this design change does not introduce a new potential accident to those previously evaluated and, therefore, does not impact the safety conclusion that the staff had previously reached in its FSER for the initially certified ABWR design as documented in NUREG-1503.

#### *9.1.1.4 Conclusion*

Based on the evaluation provided in this supplement FSER, the staff concludes that the design change to remove the NFSV does not alter the staff safety findings in NUREG-1503, the staff FSER for the initially certified design. Therefore, the ABWR design, as modified, continues to meet all applicable regulatory requirements including GDC 2, GDC 4, GDC 61, GDC 63, 10 CFR 20.1101(b), 10 CFR 50.68, and 10 CFR 52.47(b)(1) as reviewed by the staff in accordance with the associated SRP acceptance criteria in Section 9.1.2, Revision 4.

## References

1. 10 CFR 20.1101, "Radiation Protection Programs." 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 4, "Environmental and Dynamic Effects Design Bases"
4. 10 CFR Part 50, Appendix A, GDC 61, "Fuel Storage and Handling and Radioactivity Control."
5. 10 CFR Part 50, Appendix A, GDC 63, "Monitoring Fuel and Waste Storage."
6. 10 CFR 50.68, "Criticality Accident Requirements."
7. 10 CFR Part 52, Appendix A, "Design Certification Rule for the ABWR Design."
8. 10 CFR 52.47, "Contents of Applications; Technical Information."
9. NRC, NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design," July 1994 (ADAMS Accession No. ML080670592).
10. 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).
11. NRC, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Section 9.1.2, "New and Spent Fuel Storage," Revision 4, March 2007 (ADAMS Accession No. ML070550057).
12. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 4, Tier 1 and Tier 2, March 1997 (ADAMS Accession No. ML11126A129).
13. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 5, Tier 1 and Tier 2, December 2010 (ADAMS Accession No. ML110040323).
14. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 6, Tier 1 and Tier 2, February 2016 (ADAMS Accession No. ML16214A015).
15. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 7, Tier 1 and Tier 2, December 2019 (ADAMS Accession No. ML20007E371).