

**11 RADIOACTIVE WASTE MANAGEMENT**

<b>11.4 Solid Waste Management Systems</b>	<b>1</b>
<b>11.4.1 Regulatory Criteria</b>	<b>1</b>
<b>11.4.2 Summary of Technical Information</b>	<b>2</b>
<b>11.4.3 Technical Evaluation</b>	<b>3</b>
<b>11.4.4 Conclusion</b>	<b>3</b>

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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. 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 11, "Radioactive Waste Management," Section 11.4, "Solid Waste Management System," 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.

### 11.4 Solid Waste Management System

Section 11.4.2, of NUREG-1503, the staff FSER for the original ABWR DC, indicates that the solid waste management system meets the guidance of Regulatory Guide (RG) 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Revision 1, issued October 1979. However, in reviewing DCD Tier 2, Section 11.4 for the GEH DC renewal application, it was unclear that the solid waste management system was to be designed, constructed, and tested in accordance with the criteria in RG 1.143. In addition, there were apparent discrepancies in the ABWR DCD regarding the off-gas system and off-gas vault design (which are mostly discussed in DCD Tier 2, Section 11.3). This supplemental evaluation documents the staff's review of the design of the radioactive waste management system, as it relates to conformance with RG 1.143 and compliance with the associated regulatory requirements in the ABWR DCD, Revision 7.

#### 11.4.1 Regulatory Criteria

As explained below, the ABWR DCD changes related to the solid waste management system are to supply information omitted from the originally certified DCD to ensure that the solid waste management system meets the regulations applicable and in effect at initial certification. The changes related to the off-gas system and off-gas vault are to correct errors and inconsistencies in the originally certified ABWR DCD associated with the off-gas system and off-gas vault design descriptions to ensure that the off-gas system and off-gas vault meets the regulations applicable and in effect at initial certification. Therefore, the changes are "modifications," as this term is defined in Chapter 1 of this supplement and will be evaluated using the regulations applicable and in effect at initial certification.

The following regulatory requirements provide the basis for the acceptance criteria for the staff's review:

- 10 CFR 52.47(a)(1)(i) (1997), requires that the DC application must contain the technical information which is required of applicants for construction permits and operating licenses by 10 CFR Part 20, "Standards for Protection against Radiation," 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," and its appendices, and 10 CFR Part 73, "Physical Protection of Plants and Materials," and 10 CFR Part 100, "Reactor Site Criteria," that is technically relevant to the design and not site-specific.
- 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criterion (GDC) 2, "Design Bases for Protection Against Natural Phenomena" (1997), requires that structures, systems, and components important to safety be designed to withstand the effects of natural phenomena without loss of capability to perform their safety functions. The design bases for these structures, systems, and components must 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.
- 10 CFR Part 50, Appendix A, GDC 60, "Control of Releases of Radioactive Materials to the Environment" (1997), requires that the nuclear power unit design include means to control suitably the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes during normal reactor operation, including anticipated operational occurrences.
- 10 CFR Part 50, Appendix A, GDC 61, "Fuel Storage and Handling and Radioactivity Control" (1997), requires the fuel storage and handling, radioactive waste, and other systems that might contain radioactivity to be designed to assure adequate safety under normal and postulated accident conditions, including appropriate containment, confinement, and filtering systems for radioactive waste systems.

#### *11.4.2 Summary of Technical Information*

RG 1.143, provides, in part, design, construction, and testing criteria for radioactive waste management structures, systems, and components at nuclear power plants. Following the guidance of RG 1.143 ensures that the radioactive waste management systems comply with the pertinent portions of the GDC within the scope of this supplement SER discussed above. GEH ABWR DCD Tier 2, Table 1.8-20, indicates that RG 1.143, Revision 1, is applicable to the ABWR design and DCD, Tier 2, Sections 11.2 and 11.3, provide information and commitments that ensure systems and components of the liquid and gaseous waste management systems (including associated structures) are designed and tested in accordance with RG 1.143. However, while NUREG-1503, Section 11.4.2, indicates that the solid waste management system meets the guidelines of RG 1.143, there was no specific commitment in the DCD that the solid waste management system would be designed, constructed, and tested in accordance with RG 1.143. RG 1.143, Regulatory Position 3, specifies the design and testing criteria for solid waste management systems and Regulatory Position 6 provides the quality assurance criteria.

In a request for additional information (RAI) 11.04-1, dated March 12, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15069A674), the staff requested that GEH provide information ensuring that the solid waste management system conforms with RG 1.143, Revision 1, or provide an alternative approach to meeting the NRC regulations. In addition, while the ABWR DCD Tier 2 Section 11.3, specifies that the off-gas system is designed in accordance with RG 1.143, DCD Tier 2, Table 3.2-1, contained several apparent errors and inconsistencies that could potentially create confusion regarding the off-gas system and off-gas vault design. Therefore, the staff requested that the applicant also correct these errors and inconsistencies in ABWR DCD Tier 2, Table 3.2-1.

#### *11.4.3 Technical Evaluation*

In its response to RAI 11.04-1 (ADAMS Accession No. ML15099A586), the applicant proposed updating DCD Tier 2, Section 11.4.1.2, to specify that the solid waste management system design “compli[es] with Regulatory Guide 1.143.” This would include any mobile equipment that is used. In addition, in the response, the applicant corrected the errors associated with the ABWR DCD Tier 2, Table 3.2-1, which clarifies that the off-gas system and off-gas vault will be designed in accordance with RG 1.143, Revision 1.

In Supplement 1 of its response to RAI 11.04-1 (ADAMS Accession No. ML15202A045), the applicant proposed including additional information in ABWR DCD Tier 2, Section 11.4.1.2, not only to specify that the solid waste management system complies with RG 1.143, but also to state that this includes the quality classification, construction, and testing requirements in DCD Tier 2, Section 11.2.1.2.1, and the building requirements in DCD Tier 2, Section 11.2.1.2.2. These sections provide the design information, including codes and standards, consistent with RG 1.143, Revision 1, for which the solid waste management system must be designed. Therefore, the response to RAI 11.04-1, including Supplement 1, provides DCD changes which ensure that the solid waste management system and off-gas system (including associated structures) are designed, constructed, and tested, in accordance with RG 1.143, Revision 1. The staff finds this to be acceptable.

The staff verified that the DCD changes described in the response to RAI 11.04-1, including Supplement 1, were incorporated into DCD Revision 7. Therefore, this issue is resolved.

#### *11.4.4 Conclusion*

Based on the above, the ABWR DCD, Revision 7, meets the requirements of 10 CFR 52.47(a)(1)(i) (1997). In addition, the design, construction, and testing criteria for the structures, systems, and components associated with the solid radioactive waste management system and off-gas system and off-gas vault conform to the guidance in RG 1.143, Revision 1, and the information in the DCD is now consistent regarding the design of the off-gas system and off-gas vault. Conformance with RG 1.143, Revision 1, in combination with other aspects of the design, including the design requirements of these structures, the control of radioactive effluents, the radiation shielding design, and other radiation protection design features ensure that these structures, systems, and components are in compliance with 10 CFR Part 50, Appendix A, GDC 2, 60, and 61. Therefore, these ABWR DC design changes are acceptable.

## References

1. 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."
2. 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants."
3. 10 CFR Part 50, Appendix A, GDC 2, "Design Bases for Protection Against Natural Phenomena."
4. 10 CFR Part 50, Appendix A, GDC 60, "Control of Releases of Radioactive Materials to The Environment."
5. 10 CFR Part 50, Appendix A, GDC 61, "Fuel Storage and Handling and Radioactivity Control."
6. NRC, NUREG-1503, "Final Safety Evaluation Report Related to the Certification of the Advanced Boiling Water Reactor Design," July 1994 (ADAMS Accession No. ML080670592).
7. 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).
8. NRC, RG-1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Revision 1, October 1979.
9. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 5, Tier 1 and Tier 2, December 2010 (ADAMS Accession No. ML110040323).
10. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 6, Tier 1 and Tier 2, February 2016 (ADAMS Accession No. ML16214A015).
11. GEH, ABWR Standard Plant Design Certification Renewal Application Design Control Document, Revision 7, Tier 1 and Tier 2, December 2019 (ADAMS Accession No. ML20007E371).