

3.0 Design Of Structures, Components, Equipment, And Systems

3.7.3 Seismic Subsystem Analysis

3.7.3.1 *Regulatory Criteria*

The certified ABWR DCD did not provide information regarding the design and analysis of the tunnel structures for diesel generator fuel oil transfer systems (DGFOTS). The applicant addressed this omission by providing proposed changes to the ABWR DCD in a letter dated July 17, 2015 (ADAMS Accession No. ML15198A344) to explicitly specify the seismic Category I tunnel structures to be a reinforced concrete tunnel and be designed and analyzed according to NRC's Standard Review Plan (SRP) Section 3.7.3. ABWR DCD, Revision 6, identifies Revision 2 of SRP Section 3.7.3 as the applicable version for the ABWR design. In addition, GEH proposed to add a COL information item directing COL applicants referencing the ABWR design to provide the design and analysis for the DGFOTS tunnel structures for routing the fuel oil transfer piping and cable system from the fuel oil storage tank to the diesel generator (DG) in the reactor building. The applicant is not changing the ABWR design, but rather specifying the classification and criteria consistent with SRP Section 3.7.3, Revision 2, to be used by COL applicants to design and analyze the tunnel structures. The proposed revisions effectively constitute interface requirements that should have been identified in the initial DCD to satisfy 10 CFR 52.47(a)(1)(vii) (1997). GEH also proposed clarifications to DCD Tier 2, Sections 3.8.4.1.3 and 3.12.3 that are unrelated to the DGFOTS tunnel structures. These clarifications are consistent with the original understanding of the design information in the initial design certification. Therefore, the proposed changes are "modifications," as this term is defined in Chapter 1 of this supplement.

The applicable regulatory requirements for evaluating the proposed GEH ABWR DCD modifications are as follows:

1. 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 2 (1997), "Design bases for protection against natural phenomena," requires, in the relevant parts, that structures, systems, and components (SSCs) important to safety be designed to withstand the effects of natural phenomena such as earthquakes, without loss of capacity to perform their intended safety functions. GDC 2 further requires that the design bases reflect appropriate consideration of the most severe 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 historical data have been accumulated in the past.
2. 10 CFR Part 100, Appendix A (1997), "Seismic and Geologic Siting Criteria for Nuclear Power Plants," requires considering two earthquake levels, the safe shutdown earthquake (SSE) and operating basis earthquake, in the design of safety-related SSCs. Appendix A to 10 CFR Part 100 further states that the engineering method used to ensure that the required safety functions are maintained during and after the vibratory ground motion associated with the SSE, shall involve the use of either a suitable dynamic analysis or a suitable qualification test to demonstrate that SSCs can withstand

the seismic and other concurrent loads, except where it can be demonstrated that the use of an equivalent static load method provides adequate conservatism.

3. 10 CFR 52.47 (1997), "Content of applications." 10 CFR 52.47(a)(1)(vii) requires the interface requirements to be met by those portions of the plant for which the application does not seek certification. Also, 10 CFR 52.47(a)(1)(viii) (1997) requires justification that compliance with the interface requirements of this section is verifiable through inspections, tests, or analyses, and requires the method to be used for verification of interface requirements to be included as part of the proposed inspections, tests, analyses, and acceptance criteria (ITAAC) required by 10 CFR 52.47(a)(1)(vi).

3.7.3.2 *Summary of Technical Information*

GEH submitted the proposed changes in a letter dated July 17, 2015 (ADAMS Accession No. ML15198A344) to indicate that the tunnel structures for DGFOTS are seismic Category I. In addition, GEH proposed a COL information item directing COL applicants to provide the design and analysis of the tunnel structures in accordance with SRP Section 3.7.3, Revision 2. GEH also proposed clarifications to DCD Tier 2, Sections 3.8.4.1.3 and 3.12.3 that are unrelated to the DGFOTS tunnel structures

3.7.3.3 *Technical Evaluation*

The staff reviewed the proposed changes to GEH ABWR DCD Tier 2, Revision 6, Table 1.9-1, "Summary of ABWR Standard Plant COL License Information," and Sections 3.7.3.12, "Buried Seismic Category I Piping and Tunnels," 3.8.4.1.3, "Radwaste Building Substructure," 3.12.2.1 "Design Basis," and 3.12.3, "Miscellaneous Non-Safety Related Tunnels"; and new Sections 3.8.4.1.6, "Seismic Category I Buried Piping, Conduit and Tunnels," and 3.8.6.5, "Seismic Category I Buried Piping, Conduits, and Tunnels" in order to determine compliance with GDC 2 in 10 CFR Part 50, Appendix A (1997) and 10 CFR Part 100, Appendix A (1997). The staff used the review guidance in SRP Section 3.7.3, Revision 2 to conduct its review.

In a letter dated July 17, 2015 (ADAMS Accession No. ML15198A344), GEH added the COL information item for seismic Category I buried piping, conduits and tunnels to the list of COL information items in DCD Tier 2, Table 1.9-1. In DCD Tier 2, Section 3.7.3.12, GEH added text to describe the physical characteristics and design/analysis specifications of seismic Category I underground tunnels as reinforced concrete structures in direct contact with soil and having adequate dynamic clearance to their housing piping/cables to avoid transmission of seismic inground accelerations and displacements. GEH also added the statement that the design and analysis of seismic Category I underground tunnels follow the engineering process specified in SRP Section 3.7.3, Revision 2. In the new DCD Tier 2, Section 3.8.4.1.6, GEH added that the seismic Category I buried piping, conduits and tunnels, shall be designed and analyzed per SRP Section 3.7.3, Revision 2. In the new DCD Tier 2, Section 3.8.6.5, GEH stated that the COL applicant shall provide a Design and Analysis report for seismic Category I buried piping, conduits and tunnels per SRP Section 3.7.3, Revision 2, and referred to DCD Tier 2, Section 3.7.3.12. GEH also described in DCD Tier 2, Section 3.12.2.1, that specific seismic requirements are included in Section 3.7.3.12 and specified in SRP Section 3.7.3. The staff reviewed the proposed changes in DCD Tier 2, Table 1.9-1, Sections 3.7.3.12, 3.8.4.1.6, and 3.8.6.5, and concludes that it is not practical to perform seismic Category I assessment for the tunnel structures at this stage because site-specific soil information is not available. Therefore,

the staff finds it acceptable to defer the design and analysis of seismic Category I tunnel structures to the COL applicant because (1) the proposed changes provide assurance that the seismic Category I tunnel structures will not be adversely affected by the adjacent Diesel Oil Storage Tank and Reactor Building structures under design-basis loads, and (2) the design and analysis of the tunnel structures will be performed by the COL applicant per the guidelines provided in SRP Section 3.7.3, Revision 2. The staff also concludes that interface requirements for the seismic Category I tunnel structures must be met for those portions of the plant for which the applicant does not seek certification. The staff further concludes that the interface requirements can be verified by ITAAC because they are similar to other requirements that are normally verified by ITAAC. GEH has not identified a specific method for this verification; therefore, it is the responsibility of the COL applicant to develop an ITAAC for the seismic Category I tunnel structures to ensure the safety functions of diesel generators.

In a letter dated July 17, 2015 (ADAMS Accession No. ML115198A344), GEH also added the text “rebar stress and required rebar” to DCD Tier 2, Section 3.8.4.1.3 that included rebar information for the Radwaste Building (RW/B). In addition, GEH added the text “Non-Safety Related” to the title of DCD Tier 2, Section 3.12.3. The staff reviewed the these editorial changes in DCD Tier 2, Sections 3.8.4.1.3 and 3.12.3, and finds that they are not relevant to the seismic Category I tunnel structures of DGFOTS; however they are acceptable to the staff because (1) GEH follows the common engineering principles and practices, which clarify the rebar information for the RW/B, and (2) the change of the title of DCD Tier 2, Section 3.12.3 is consistent with the contents of this section.

3.7.3.4 Conclusion

Based on the evaluation provided in this SER supplement, the staff concludes that the COL applicant’s conformance with the provisions of SRP Section 3.7.3, Revision 2 provides reasonable assurance that the structural integrity of the tunnel structures for DGFOTS in the GEH ABWR design will not be impaired in the event of design-basis loads. In consequence, all seismic Category I utilities (i.e., piping, conduits, or auxiliary system components) that are routed within these tunnels are adequately protected, and will perform their intended safety functions. Therefore, the staff concludes that the requirements of GDC 2 in 10 CFR Part 50, Appendix A, 10 CFR Part 100, Appendix A and 10 CFR 52.47 are met.