October 10, 2006

Mr. David H. Hinds, Manager, ESBWR
General Electric Company
P.O. Box 780, M/C L60
Wilmington, NC 28402-0780

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 70 RELATED TO ESBWR DESIGN CERTIFICATION APPLICATION

Dear Mr. Hinds:

By letter dated August 24, 2005, General Electric Company (GE) submitted an application for final design approval and standard design certification of the economic simplified boiling water reactor (ESBWR) standard plant design pursuant to 10 CFR Part 52. The Nuclear Regulatory Commission (NRC) staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed design.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter. This RAI concerns Chapter 14 of the ESBWR Design Control Document (DCD). The RAI questions with a 14.2 number concern the initial test program contained in DCD Tier 2, Revision 1. The RAI questions with a 14.3 number concern DCD Tier 1, Revision 1 and the description of Tier 1 contained in DCD Tier 2, Revision 1, Section 14.3. RAI Question 14.3-26 was sent to you via electronic mail on July 1, 2006. RAI Question 14.3-67 was sent to you via electronic mail on July 10, 2006. Both of these were discussed with you during a teleconference on September 28, 2006. You agreed to respond to these RAI questions with the following schedule:

October 20, 2006: Question 14.3-26

October 31, 2006: Question 14.3-67

To support the review schedule, you are requested to respond to the remaining RAI questions in the enclosure by November 22, 2006.

If you have questions or comments concerning this matter, please contact me at (301) 415-1446 or dba@nrc.gov or you may contact Amy Cubbage at (301) 415-2875 or aec@nrc.gov.

Sincerely,

/RA/

Donald B. Allen, Project Manager
ESBWR/ABWR Projects Branch
Division of New Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 52-010

Enclosure: As stated

If you have questions or comments concerning this matter, please contact me at (301) 415-1446 or dba@nrc.gov or you may contact Amy Cubbage at (301) 415-2875 or aec@nrc.gov.

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Requests for Additional Information (RAIs)
ESBWR Design Control Document (DCD) Tier 2, Revision 1, Chapter 14 and Tier 1, Revision 1

RAI Number	Reviewer	Question Summary	Full Text
14.2-22	Rajan J	Identify the specific systems for which thermal expansion testing would be performed during the preoperational phase.	It is stated in DCD Tier 2, Revision 1, Section 14.2.8.1.42, that thermal expansion testing during the pre-operational phase is limited to those systems that are expected to be heated up significantly above their normal ambient temperatures. The applicant is requested to identify the specific systems for which thermal expansion testing would be performed during the pre-operational phase.
14.2-23	Rajan J	Identify the steady state modes, transients and flow changes during which pre-operational vibration testing would be performed.	It is stated in DCD Tier 2, Revision 1, Section 14.2.8.1.42, that vibration testing is performed during critical steady-state operating modes and during transients such as pump starts and stops, valve stroking, and significant process flow changes. The applicant is requested to identify the specific steady state operating modes, operational transients and the process flow changes during which pre-operational vibration testing would be performed.
14.2-24	Rajan J	Discuss the expansion, vibration and dynamic effects pre-operational test program's conformance with regulatory guides.	DCD Tier 2, Revision 1, Section 14.2.8.1.42, does not contain sufficient information relative to the expansion, vibration and dynamic effects preoperational test program's conformance with applicable regulatory guides. The applicant is requested to discuss the expansion, vibration and dynamic effects preoperational test program's conformance with Regulatory Guides 1.68 and other applicable regulatory guides. Also provide a discussion relating to exceptions to regulatory positions, if any, and justifications for each exception.
14.2-25	Rajan J	Provide conclusions from review of operating and testing experiences and their effect on the vibration test program.	DCD Tier 2, Revision 1, Section 14.2.8.1.42, does not contain sufficient information relative to the applicant's review of operating and testing experiences at other reactor facilities. The applicant is requested to provide a summary of the principal conclusions or findings from the applicant's review of operating and testing experience at other reactor facilities and their effect on the expansion, vibration and dynamic effects pre-operational test program.

RAI Number	Reviewer	Question Summary	Full Text
14.2-26	Rajan J	Provide the type and source of design performance information to be used in the development of detailed expansion test procedures.	DCD Tier 2, Revision 1, Section 14.2.8.2.9, does not contain sufficient information relative to the design performance and test procedures for the staff to assess the adequacy of the development of the systems expansion test procedures. The applicant is requested to provide the type and source of design performance information that will be, or is being, used in the development of detailed systems expansion test procedures.
14.2-27	Rajan J	Discuss the systems expansion test program's conformance with regulatory guides.	DCD Tier 2, Revision 1, Section 14.2.8.2.9, does not contain sufficient information relative to the systems expansion test program's conformance with applicable regulatory guides. Therefore the staff requests the applicant to discuss the systems expansion test program's conformance with Regulatory Guides 1.68 and other applicable regulatory guides. Also provide a discussion relating to exceptions to regulatory positions, if any, and justifications for each exception.
14.2-28	Rajan J	Provide conclusions from review of operating and testing experiences and their effect on the systems expansion test program.	DCD Tier 2, Revision 1, Section 14.2.8.2.9, does not contain sufficient information relative to the applicant's review of operating and testing experiences at other reactor facilities. The applicant is requested to provide a summary of the principal conclusions or findings from the applicant's review of operating and testing experiences at other reactor facilities and their effect on the systems expansion test program.
14.2-29	Rajan J	Provide additional information regarding the system expansion test program schedule and sequence for conducting the tests post core load.	DCD Tier 2, Revision 1, Section 14.2.8.2.9, does not contain sufficient information relative to the test program schedule and sequence for the system expansion test phase. The applicant is requested to provide additional information regarding the system expansion test program schedule, and sequence for conducting the tests planned for the system expansion test phase. Also provide the time available between approval of testing procedures and their intended use.

RAI Number	Reviewer	Question Summary	Full Text
14.2-30	Rajan J	Provide additional information regarding the special test of the effects of thermal stratification in the feedwater discharge piping.	DCD Tier 2, Revision 1, Section 14.2.8.2.9, does not contain sufficient information regarding the special test which will be conducted to monitor the effects of thermal stratification in the feedwater discharge piping to establish the functional adequacy of this piping. The applicant is requested to provide additional information to include acceptance criteria and conformance with applicable regulatory guides regarding the special test which will be conducted to monitor the effects of thermal stratification in the feedwater discharge piping.
14.2-31	Rajan J	Identify the anticipated operational occurrences.	It is stated in the DCD Tier 2, Revision 1, Section 14.2.8.2.10, that piping vibration will be verified during steady state and anticipated operational occurrences. The applicant is requested to identify the anticipated operational occurrences.
14.2-32	Rajan J	Provide type and source of design performance information used in development of post core load vibration test procedures.	DCD Tier 2, Revision 1, Section 14.2.8.2.10, does not contain sufficient information relative to the design performance and test procedures for the staff to assess the adequacy of the development of the system vibration test procedures. The applicant is requested to provide the type and source of design performance information that will be, or is being, used in the development of detailed system vibration test procedures.
14.2-33	Rajan J	Provide conclusions from review of operating and testing experiences and their effect on the post core load vibration test program.	DCD Tier 2, Revision 1, Section 14.2.8.2.10, does not contain sufficient information relative to the applicant's review of operating and testing experience at other reactor facilities. The applicant is requested to provide a summary of the principal conclusions or findings from the applicant's review of operating and testing experience at other reactor facilities and their effect on the system vibration test program.
14.2-34	Rajan J	Discuss the system vibration test program’s conformance with regulatory guides.	DCD Tier 2, Revision 1, Section 14.2.8.2.10, does not contain sufficient information relative to the system vibration test program’s conformance with applicable regulatory guides. The applicant is requested to discuss the vibration test program’s conformance with Regulatory Guides 1.68 and other applicable regulatory guides. Also provide a discussion relating to exceptions to regulatory positions, if any, and justifications for each exception.

RAI Number	Reviewer	Question Summary	Full Text
14.2-35	Rajan J	Provide additional information regarding the system vibration test program schedule and sequence for post core load.	DCD Tier 2, Revision 1, Section 14.2.8.2.10, does not contain sufficient information relative to the system vibration test program schedule and sequence for the system vibration test phase. The applicant is requested to provide additional information regarding the system vibration test program schedule and sequence for conducting the tests planned for the system vibration test phase. Also provide the time available between approval of testing procedures and their intended use.
14.2-36	Wang W	Document organization	DCD Tier 2, Revision 1, Chapter 14.2.8, Individual Test Descriptions, did not list tests in the table of contents. To find a specific component test, you have to look through the whole chapter which is extremely time consuming. Please list all tests in the table of contents. Table of Contents for other new reactors have also classified tests in categories for safety-related functions, defense-in-depth functions, non-safety-related radioactive system functions, and additional non-safety-related functions.
14.2-37	Wang W	Conformance with Regulations	Standard Review Plan (SRP) Section 14.2, Revision 2 - July 1981, Subsection II "Acceptance Criteria" included a list of Regulatory Guides (RGs) that provided more detailed information pertaining to testing. DCD Tier 2, Revision 1, Section 14.2.3, "Test Programs' Conformance with Regulatory Guides," did not list all of RGs recommended by SRP 14.2.II. DCD Tier 2, Revision 1, Chapter 1 listed applicable RGs and RGs 1.56, 1.128, 1.136 are listed "yes" for ESBWR. Please provide justifications for why you are not using RGs 1.56, 1.128, or 1.136 in Chapter 14 for initial test program.
14.2-38	Thomas G Wang W	General comments	The term "proper" is used throughout the DCD. For example, in DCD Tier 2, Revision 1, Section 14.2.8.1.65, it states, as a bullet, "Proper operation of instrumentation and equipment in all combinations of logic and instrument channel trip". The term proper is vague and subjective. For this example, how is proper operation defined in conjunction with all combinations of logic and instrument channel trip? In general, how is proper defined? Does the same definition of proper, which is used extensively, apply throughout the DCD?

RAI Number	Reviewer	Question Summary	Full Text
14.2-39	Wang W Thomas G	CRD test	Does DCD Tier 2, Revision 1, Section 14.2.8.1.4 control rod drive system pre-operational test include verifying “correct failure mode on loss of power?” Regulatory Guide 1.68, Revision 2 - 08/1978, Appendix A.1.b.1, control rod drive system tests, has a statement, “Demonstrate proper operation, including correct failure mode on loss of power, for the control rod drive system and proper operation of system alarms”. Please clarify this. In addition, it is not clear if the CRD high-pressure makeup mode of operation will be tested. This mode of operation will be initiated by a low reactor water Level 2 signal and standby pump will be started and the injection valves will automatically open. Please clarify if this operation and both CRD pumps will be tested.
14.2-40	Thomas G	DPV tests	Depressurization Valve (DPV) tests are not listed in the test plan. Even though GE might have completed the DPV tests, NRC recommends GE include DPV tests in DCD Tier 2, Chapter 14 for document completeness.
14.2-41	Wang W	GDCS testing conditions	DCD Tier 2, Revision 1, Section 14.2.8.1.65, GDCS testing: please provide information on test set up conditions (e.g., vessel and dry well pressures) and what limiting conditions will be considered in the tests. In addition, will GDCS testing be performed with check valves and squib valves installed?
14.2-42	Wang W	Test ordering	DCD Tier 2, Revision 1, Section 14.2.8.2.3: Regulatory Guide 1.68, Revision 2 - 08/1978, Appendix A, Section 2, recommended tests AFTER the core is fully loaded. List C required “Final functional testing of the reactor protection system to demonstrate proper trip points, logic, and operability of scram breakers and valves. Demonstrate operability of manual scram functions". However, in DCD Tier 2, Revision 1, Section 14.2.8.2.3, the RG 1.68 recommended tests were planned PRIOR TO (instead of “after“) commencing fuel loading. Please provide information if GE will perform the tests listed above after the core is fully loaded or justify if there is no such plan.
14.2-43	Wang W	Initial Fuel Loading pre-loading analysis.	DCD Tier 2, Revision 1, Section 14.2.8.2.3: Regulatory Guide 1.68, Revision 2 -08/1978, Appendix A.2, Initial Fuel Loading and Precritical Tests require “Prediction of core reactivity should be prepared in advance to aid in evaluating the measured responses to specified loading increments”. In test description 14.2.8.2.3, it is not clear if GE will make predictions of core reactivity and what actions will be taken if the measured results deviate from expected values. Please clarify.

RAI Number	Reviewer	Question Summary	Full Text
14.2-44	Wang W	Core flow and core power calculation and measured variables	As stated in DCD Tier 2, Revision 1, Section 14.2.8.2.7, the purpose of Core Performance tests are to demonstrate that the various core and reactor performance characteristics such as power and flow, core power distributions, and those parameters used to demonstrate compliance with core thermal limits and plant license conditions are in accordance with design limits and expectations. This section also states “Core flow is calculated from a heat and mass-flow balance on the downcomer. Core power is calculated from a heat and mass-flow balance on the nuclear boiler”. Please provide specific methods on how you will calculate core flows and core power. What variables will be obtained from the in-vessel measurement to calculate core flows and core power? Please provide a detailed test plan for testing vessel natural circulation at various power levels after fuel loading during startup testing.
14.2-45	Wang W Thomas G	TRACG validation plan	DCD Tier 2, Revision 1, Section 14.2.8.2, includes the transient tests. Does GE have plans to validate TRACG code using the data obtained from these transient tests (for the first ESBWR which will come to operation)?
14.2-46	Hernandez J	Condensate and feedwater systems pre-operational test - revision for clarity	DCD Tier 2, Revision 1, Section 14.2.8.1.44: Revise bullet #4 on Page 14.2-42. Add “condensate, condensate booster, and feedwater pumps” for consistency with position C.1.a of Regulatory Guide (RG) 1.68.1, Revision 1 - 01/1977.
14.2-47	Hernandez J	Condensate and feedwater systems pre-operational test - feedwater control valve testing clarification	DCD Tier 2, Revision 1, Section 14.2.8.1.44: Clarify if feedwater flow control valve testing will verify proper response of valves for the design operating range, correct operation and protective features, as described in regulatory position C.1.d of Regulatory Guide 1.68.1, Revision 1 -01/1977.
14.2-48	Hernandez J	Condensate and feedwater systems pre-operational test - compliance with RG 1.68	DCD Tier 2, Revision 1, Section 14.2.8.1.44, does not include a comprehensive feedwater control system test as described in regulatory position C.1.f of Regulatory Guide 1.68.1, Revision 1 -01/1977. Provide a justification or an alternative method of demonstrating operability of the feedwater control system.

RAI Number	Reviewer	Question Summary	Full Text
14.2-49	Hernandez J	Condenser evacuation system pre-operational test - system name consistency with DCD Tier 2	Perform a global revision to the title of DCD Tier 2, Revision 1, Section 14.2.8.1.47 to maintain consistency with DCD Tier 2 , Revision 1, Section 10.4.2, “Condenser Air Removal System.”
14.2-50	Hernandez J	Circulating water system (CIRC) pre-operational test - clarification of acceptance criteria	DCD Tier 2, Revision 1, Section 14.2.8.1.50: The ABWR DCD included the following acceptance criteria for the CIRC pre-operational testing: 1. Verifying acceptable pump NPSH under the most limiting design flow conditions. 2. Verifying proper system operation while powered from primary and alternate sources, including transfers, and in degraded modes for which the system is expected to remain operational. Confirm if the ESBWR pre-operational testing includes similar acceptance criteria.
14.2-51	Hernandez J	Main turbine control system pre-operational test - clarification of acceptance criteria	DCD Tier 2, Revision 1, Section 14.2.8.1.53 : The ABWR DCD includes the following acceptance criteria for the main turbine control system pre-operational testing: 1. Verifying proper operation of trip devices for main stop and control valves and CIVs. Confirm if the ESBWR pre-operational testing includes similar acceptance criteria.
14.2-52	Hernandez J	Steam bypass and pressure control (SB&PC) system pre-operational test - revise typo	Revise typo in the prerequisites of DCD Tier 2, Revision 1, Section 14.2.8.1.55. Second sentence should read “...to the extent necessary...”
14.2-53	Hernandez J	Main turbine and auxiliaries pre-operational test - include testing of the overspeed trip system	Revise the DCD Tier 2, Revision 1, Section 14.2.8.1.59, to include testing of the overspeed trip system.

RAI Number	Reviewer	Question Summary	Full Text
14.2-54	Hernandez J	Steam and power conversion system performance - provide detailed acceptance criteria for startup test	DCD Tier 2, Revision 1, Section 14.2.8.2.33, states that operation and testing of power conversions systems is discussed in Chapter 10. However, Chapter 10 testing descriptions, in general, are limited to pre-operational testing. Provide specific acceptance criteria for each of the power conversion systems and components, similar to the descriptions provided in Section 14.2.12.2.39, Level 2 acceptance criteria of the ABWR DCD to ensure all power conversion systems and components meet their design criteria.
14.2-55	McConnell M	DC Power Supply System Pre-operational Test - Battery Duty Cycle Discrepancy	DCD Tier 2, Revision 1, Section 14.2.8.1.35: On page 14.2-34 of DCD Tier 2, the sixth bullet which states 'Verify that safety-related batteries are capable to support essential loads for a period of 24 or 72 hours;' does not accurately reflect the newly revised DCD for chapter 8 (i.e., the ESBWR design will only utilize Class 1E batteries with a 72-hour duty cycle). Justify the discrepancy.
14.2-56	Morris G	AC System - Test to demonstrate adequacy of programming of microprocessor based protective devices	DCD Tier 2, Revision 1, Section 14.2.8.1.36: Describe how you will ensure the effectiveness of the programming of the required microprocessor based protective device characteristics.
14.2-57	Morris G	AC System - Test to demonstrate proper termination of cables	DCD Tier 2, Revision 1, Section 14.2.8.1.36: Provide the system tests that demonstrate proper termination of power and control cables.
14.2-58	Morris G	Standby Diesel Generator Pre-operational Test - Availability of diesel fuel onsite	DCD Tier 2, Revision 1, Section 14.2.8.1.37: Provide assurance that adequate diesel fuel will be available onsite to perform the schedule tests and support the standby diesel generator mission times.

RAI Number	Reviewer	Question Summary	Full Text
14.2-59	Morris G	Standby Diesel Generator Pre-operational Test - Bases for continuous rating of standby diesel generator	Describe the bases for the phrase 'at a load equivalent to the continuous rating' that is used in the following quote from DCD Tier 2, Revision 1, Section 14.2.8.1.37, on page 14.2-36: Full-load carrying capability of the diesel generators for a period of not less than 24 hours, of which 22 hours are at a load equivalent to the continuous rating of the diesel generator and 2 hours are at the manufacturer's 2-hour load rating, including verification that the diesel cooling systems function within design limits, and that the HVAC System maintains the DG room within design limits; Our understanding is that the continuous rating should include the kVA and pf.
14.2-60	Morris G	Standby Diesel Generator Pre-operational Test - Capability of fuel oil system	DCD Tier 2, Revision 1, Section 14.2.8.1.37: Describe how the capability of the fuel oil system to support simultaneous running of all standby diesel generators connected to a common fuel oil storage tank will be demonstrated.
14.3-26	Talbot F Kavanagh K	A non-system based ITAAC requirement for D-RAP should be added in DCD Tier 1 and DCD Tier 2	SECY 95-132, "Policy and Technical Issues Associated with RTNSS in Passive Plant Designs (SECY-94-084)," dated May 22, 1995, states in part, "[t]he design reliability assurance program (D-RAP) shall be verified using the ITAAC process." An example non-system based D-RAP ITAAC requirement can be found in the AP1000 DCD Tier 1, Revision 9, Section 3, "Non-System Based Design Description & ITAAC," and Section 3.7, "Design Reliability Assurance Program." The applicant should add a non-system based ITAAC requirement for D-RAP to DCD Tier 1, Section 3.6 and DCD Tier 2, Section 14.3.
14.3-27	Raval J Walker H	Address each of the habitability and heating, ventilation and air conditioning system separately in DCD Tier 1	DCD Tier 1, Revision 1, Section 2.16.2: In order to meet the requirements of 10 CFR 52.47(a)(vi), 10 CFR 52.47(a)(ix), 10 CFR 52.47(a)(2), and 10 CFR 52.47(b)(2) and to depict the concise, clear, and applicable contents of the DCD Tier 2, Revision 1, Sections 6.4 and 9.4 into DCD Tier 1 sections, address each of the habitability and heating, ventilation and air conditioning (HVAC) systems separately as a stand alone system in numeral order in Tier 1 (e.g., 2.16.2.1, 2.16.2.2, 2.16.2.3, 2.16.2..X) with the following details:

RAI Number	Reviewer	Question Summary	Full Text
			- Each DCD Tier 1 section of the habitability and HVAC systems should contain its Design Description, and tables for Inspections, Tests, Analyses and Acceptance Criteria (ITAAC), applicable system component, equipment, piping/ducting, and legible system flow diagrams showing major equipment and associated instrumentation with their Tag Numbers. The stand alone systems should include (1) emergency breathing air system (EBAS), (2) control room habitability area HVAC sub-system (CRHAHVS), (3) control building general area HVAC sub-system (CBGAHVS), (4) fuel building HVAC system, (5) radwaste building HVAC system, (6) turbine building HVAC system, (7) reactor building HVAC system, (8) electrical building HVAC system, and (9) drywell cooling system.
14.3-28	Raval J Walker H	Provide a Design Description for the EBAS that includes specified information	DCD Tier 1, Revision 1, Section 2.16.2: Emergency Breathing Air System (EBAS) Design Description Provide a Design Description for the EBAS that includes cross-referencing the associated figure, ITAAC table, and table(s) for equipment, piping, and main control room habitability area heat loads. Also, provide information on ASME Code classification and seismic classification for the design and construction of components (such as air storage tanks, valves, dampers, orifices), piping, and associated pressure boundary welds.
14.3-29	Raval J Walker H	Provide an equipment table for EBAS	DCD Tier 1, Revision 1, Section 2.16.2: EBAS Component Table Provide an equipment table for air storage tanks, valves (pressure regulating valves, air delivery isolation valves, and pressure relief isolation valves), air delivery line sensors and control room differential pressure sensors. The table(s) should include information for Tag Numbers, Equipment Location, ASME Code Section status, and Seismic Category I status, Class 1E/Qualification for Harsh Environment status, Active Function status, and Loss of Motive Power Position status.
14.3-30	Raval J Walker H	Provide a piping table for EBAS	DCD Tier 1, Revision 1, Section 2.16.2: EBAS Piping Table Provide a table for EBAS piping (line) that includes Tag Numbers and ASME Code Section status, and indicate whether its functional capability is required.

RAI Number	Reviewer	Question Summary	Full Text
14.3-31	Raval J Walker H	Provide an EBAS heat load table	DCD Tier 1, Revision 1, Section 2.16.2: EBAS Room Heat Load Table Provide a table for control room habitability area and associated rooms (such as instruments and control (I&C) rooms, and dc equipment rooms) that should include the information for their specific locations (such as Room Numbers) and heat loads for first 24 hours and heat loads 24-72 hours following a bounding hypothetical accident.
14.3-32	Raval J Walker H	Provide a table for a system based design description and ITAAC for EBAS.	DCD Tier 1, Revision 1, Section 2.16.2: EBAS ITAAC Table Provide a table for a system based design description and ITAAC. The table should include ITAAC table Design Commitments, Inspection, Test, Analyses and Acceptance Criteria columns as follows: (in addition to the Items 3 and 4 identified in Table 2.16.2-2): A. Provide line items in the Design Commitment column to state that EBAS components and piping including piping boundary welds as identified in EBAS component tables (provide EBAS table numbers) are designed and constructed in accordance with the applicable codes (i.e., ASME Code Section). Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. B. Provide line items in the Design Commitment column to state that EBAS components and piping including piping boundary welds as identified in EBAS component tables (provide EBAS table numbers) retain their pressure boundary integrity at their design pressure in accordance with the requirements of the applicable codes (i.e., ASME Code Section). Also provide the related inspection/testing (e.g., hydrostatic testing) and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. C. Provide line items in the Design Commitment column to state that the seismic Category I EBAS equipment can withstand seismic design basis loads without loss of safety function. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment.

RAI Number	Reviewer	Question Summary	Full Text
14.3-32 (cont.)			D. Provide line items in the Design Commitment column to state that the identified EBAS piping is designed to combine normal and seismic design basis loads without a loss of functional capability. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. E. Provide line item(s) in the Design Commitment column to state that separation is provided between EBAS Class 1E divisions, and between Class 1E divisions and non-Class 1E cable. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. F. Provide line item(s) in the Design Commitment column to state that the EBAS provides a 72-hour supply of breathable quality air at a rate of 9.5 liter/second (100 standard cubic feet per minute (scfm)) air for the five control room pressure boundary occupants. Also provide the related inspection/testing and verification information (i.e., testing and verification of the required amount of air flow, analyses of storage capacity, and control room boundary sampling for breathable air quality) for Inspection, Test, Analyses" and Acceptance Criteria columns in order to meet the intent of the Design Commitment. G. Provide line item(s) in the Design Commitment column to state that the EBAS maintains control room habitability area at a positive pressure of 31 Pascals (0.125 inch of water gauge (W.G.)) with respect to surrounding areas. Also provide the related inspection/testing and verification information (i.e., testing and verification of the required range of air flow to confirm that the control room habitability area is capable of maintaining the positive pressurization and air leakage into the control room habitability area will be measured using tracer gas testing) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. H. Provide line item(s) in the Design Commitment column to state that the EBAS heat loads within the control room habitability area and other areas (such as I&C equipment rooms and the Class 1E dc equipment rooms) are within design basis assumptions to limit the heatup of these areas. Also provide the related inspection/testing and verification information (i.e., analysis and verification to determine the as-built heat loads within these rooms are less than or equal to the design basis information and

RAI Number	Reviewer	Question Summary	Full Text
14.3-32 (cont.)			that the corresponding report concludes that (1) the temperature and humidity in the main control room pressure boundary remain within limits for human performance for the 72-hour period, (2) the maximum temperature for the 72-hour period for the I&C rooms is less than or equal to 120^0 F, and (3) the maximum temperature for the 72-hour period for the Class 1E dc equipment rooms is less than or equal to 120^0 F) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. I. Provide line item(s) in the Design Commitment column to state that the EBAS safety-related displays and display parameters can be retrieved from the control room. Also provide the related inspection/testing and verification information (i.e., inspections and verification for retrievability) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. J. Provide line item(s) in the Design Commitment column to state that the EBAS controls exist for the remotely operated valves from the control room to perform their active functions. Also provide the related inspection/testing and verification information (i.e., stroke testing using controls in the main control room) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. K. Provide line item(s) in the Design Commitment column to state that the EBAS valves identified as having Distributed Control and Information System (DCIS) control perform their active functions. Also provide the related inspection/testing and verification information (i.e., testing using real or simulated signal) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. L. Provide line item(s) in the Design Commitment column to state that after loss of motive power, the remotely operated EBAS valves assume the indicated loss of motive power position. Also provide the related inspection/testing and verification information (i.e., testing and verification of the valves under conditions of loss of motive power) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment.

RAI Number	Reviewer	Question Summary	Full Text
14.3-33	Raval J Walker H	Provide revised Figure 2.16.2-5, "EBAS System Diagram."	DCD Tier 1, Revision 1, Section 2.16.2: EBAS ITAAC Figure Provide revised Figure 2.16.2-5, "EBAS System Diagram," that consists of major components and piping, located inside and outside the CRHA envelope (as listed in the above tables) with their associated instrumentation. Also provide the equipment and instrumentation Tag Numbers, and sizing and flow data. Accordingly, revise DCD Tier 2, Figure 9.4-2, "EBAS System Diagram."
14.3-34	Raval J Walker H	Provide Design Description for CRHAHVS that includes specific information	DCD Tier 1, Revision 1, Section 2.16.2: Control Room Habitability Area HVAC System (CRHAHVS) Design Description Provide Design Description for CRHAHVS that include cross-referencing the associated figure, ITAAC table, and table(s) for system equipment and ducting (piping). Also, provide the information on ASME Code classification and seismic classification for the design and construction of the components (such as control room habitability area (CRHA) supply, return and exhaust isolation valves/dampers, main control room supply and exhaust lines, main control room toilet exhaust line, etc.)
14.3-35	Raval J Walker H	Provide a CRHAHVS component table	DCD Tier 1, Revision 1, Section 2.16.2: CRHAHVS Component Table Provide a component table for safety-related CRHA supply, return and exhaust isolation dampers that include the information for Tag Numbers, ASME Code Section status, Seismic Category I classification, Remotely Operated Valve status, Class 1E/Qualification for Harsh Environment status, Safety Related Display valve position status, Control status, Active Function status, and Loss of Motive Power Position status.

RAI Number	Reviewer	Question Summary	Full Text
14.3-36	Raval J Walker H	Provide a piping/ducting table for CRHAHVS	DCD Tier 1, Revision 1, Section 2.16.2: CRHAHVS Piping/Ducting Table Provide a table for CRHAHVS supply lines, exhaust lines, and the main control room toilet exhaust line that includes the information for Tag Numbers, ASME Code Section status, Functional Capability Required status.
14.3-37	Raval J Walker H	Provide an Equipment table for CRHAHVS	DCD Tier 1, Revision 1, Section 2.16.2: CRHAHVS Equipment Table Provide a table for CRHA air filtration unit fans, main control room recirculation air handling unit (AHU) fans, CRHAHVS return/exhaust fans, and bathroom exhaust fans that include Tag Numbers, Display run status, and Control Function indicating Start or Run status, as appropriate.
14.3-38	Raval J Walker H	Provide ITAAC table for CRHAHVS that includes specified information	DCD Tier 1, Revision 1, Section 2.16.2: CRHAHVS ITAAC Table Provide ITAAC table that includes information for Design Commitments, Inspection, Test, Analyses and Acceptance Criteria columns as follows (in addition to the Items 1 through 5 identified in Table 2.16.2-2): A. Provide line item(s) in the Design Commitment column to state that the CRHAHVS components, as identified in component table (provide table number), piping and/ducting, as identified in component table (provide table number) and piping/ducting pressure boundary welds for these components and piping/ducting are designed and constructed in accordance with the applicable code (i.e., ASME Code Section or equivalent). Also provide the related inspection/testing and verification information (i.e., as-built inspections, ASME Section I design reports, and non-destructive examinations for the welds) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment.

RAI Number	Reviewer	Question Summary	Full Text
14.3-38 (cont.)			B. Provide line item(s) in the Design Commitment column to state that the system components and piping/ducting, as identified in component and piping/ducting tables (provide table numbers), are ASME Code Section or equivalent, and retain their pressure boundary integrity at their design pressure. Also provide the related inspection/testing and verification information (i.e., hydrostatic tests and corresponding reports conforming to ASME Section or equivalent) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. C. Provide line item(s) in the Design Commitment column to state that separation is provided between CRHAHVS Class 1E divisions, and between Class 1E divisions and non-Class 1E cable. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. D. Provide line item(s) in the Design Commitment column to state that CRHA envelope maintains habitability when radioactivity is detected. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. E. Provide line item(s) in the Design Commitment column to state that safety-related and normal displays for components and equipment are identified in component and equipment tables (provide table numbers) that can be retrieved in the main control room. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. F. Provide line item(s) in the Design Commitment column to state that controls exist in the main control room to cause the remotely operated components and equipment identified in component and equipment tables (provide table numbers) to perform their active functions. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment.

RAI Number	Reviewer	Question Summary	Full Text
14.3-39	Raval J Walker H	Revise CRHAHVS ITAAC Figure 2.16.2-4, "CRHAHVS Simplified System Diagram"	DCD Tier 1, Revision 1, Section 2.16.2: CRHAHVS ITAAC Figure Provide revised Figure 2.16.2-4, "CRHAHVS Simplified System Diagram," that consists of major components, piping/ducting, and equipment, located inside and outside the CRHA envelope (as listed in the above tables) with their associated instrumentation. Also provide the equipment and instrumentation Tag Numbers, and flow and sizing data. Accordingly, revise DCD Tier 2 Figure 9.4-1, "CRHAHVS Simplified System Diagram."
14.3-40	Raval J Walker H	Provide Design Description for CBGAHVS that include specified information	DCD Tier 1, Revision 1, Section 2.16.2: Control Building General Area HVAC system (CBGAHVS) Design Description Provide Design Description for CBGAHVS serving outside the CRHA that include cross-referencing the associated Figure, ITAAC Table, and table for the system equipment.
14.3-41	Raval J Walker H	Provide component table for CBGAHVS that includes specified information	DCD Tier 1, Revision 1, Section 2.16.2: CBGAHVS Component Table Provide component table for non-CRHA supply, return and exhaust isolation dampers or valves that include the information for Tag Numbers, ASME Code Section status, Seismic Category I classification, Remotely Operated Valve status, Class 1E/Qualification for Harsh Environment status, Display for valve position status, Control status, Active Function status, and Loss of Motive Power Position status.
14.3-42	Raval J Walker H	Provide equipment table for CBGAHVS that includes specified information	DCD Tier 1, Revision 1, Section 2.16.2: CBGAHVS Equipment Table Provide equipment table for non-CRHA supply fans and return/exhaust fans. The AHU supply fans and return/exhaust fans that include the information for Tag Numbers, Display status (i.e., Run status), and Control Function status (i.e., Start status).
14.3-43	Raval J Walker H	Provide ITAAC table for CBGAHVS	DCD Tier 1, Revision 1, Section 2.16.2: CBGAHVS ITAAC Table Provide ITAAC table consisting of Design Commitments and their associated Inspection, Test, Analyses and Acceptance Criteria as follows in addition to the Items identified in Table 2.16.2-2.

RAI Number	Reviewer	Question Summary	Full Text
14.3-43 (cont.)			A. Provide line item(s) in the Design Commitment column to state that the basic configuration of the CBGAHVS is as described in the Design Description (provide DCD Tier 1 Section number). Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. B. Provide line item(s) in the Design Commitment column to state that the Set A serves Division I/VI DCIS room, non-1E distributed control and information system (DCIS) East Room A, HVAC room, and corridor areas and Set B serves Division II/III DCIS, non-1E DCIS Room B, and CRHA corridor area by providing conditioned air. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. C. Provide line item(s) in the Design Commitment column to state that controls exist in the main control room to cause the components and equipment identified in tables (provide table numbers) to perform their active functions. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. D. Provide line item(s) in the Design Commitment column to state that displays exist in the main control room and display parameters can be retrieved from the control room. Also provide the related inspection/testing and verification information for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment. E. Provide line item(s) in the Design Commitment column to state that the CBGAHVS provides cooling to the Division I, II, III, and IV DCIS rooms and CRHA corridor. Also provide the related inspection/testing information (i.e., equipment testing will be performed using controls in the main control room) and verification information (i.e., the equipment displays can be retrieved in the main control room) for Inspection, Test, Analyses and Acceptance Criteria columns in order to meet the intent of the Design Commitment column.

RAI Number	Reviewer	Question Summary	Full Text
14.3-44	Raval J Walker H	Provide revised Figure 2.16.2-6 and Figure 2.16.2-7, for CBGAHVS (Sets A & B) Simplified System Diagram	DCD Tier 1, Revision 1, Section 2.16.2: CBGAHVS ITAAC Figure Provide revised Figures 2.16.2-6, "CBGAHVS (Set A) Simplified System Diagram," and Figures 2.16.2-7, "CBGAHVS (Set B) Simplified System Diagram," that consist of major components, piping/ducting, and equipment, located inside and/or outside the CRHA envelope (as listed in the above tables) with their associated instrumentation. Also provide the equipment and instrumentation Tag numbers, and sizing and flow data. Accordingly, revise DCD Tier 2, Figures 9.4-3, "CBGAHVS (Set A) Simplified System Diagram," and Figures 9.4-4, "CBGAHVS (Set B) Simplified System Diagram."
14.3-45	Raval J Walker H	Revise the Design Description to state that the FBHVS maintains the fuel building at a minimum negative pressure of 62 Pa (-1/4 inch W.G.)	DCD Tier 1, Revision 1, Section 2.16.2: Fuel Building HVAC System (FBHVS) Design Description Revise the Design Description to state that the FBHVS maintains the fuel building at a minimum negative pressure of 62 Pa (-1/4 inch W.G.) relative to surrounding areas to minimize exfiltration of potentially contaminated air to reflect the text of DCD Tier 2 Section 9.4.2.
14.3-46	Raval J Walker H	Provide a component table for fuel building pressure differential indicators that include specified information	DCD Tier 1, Revision 1, Section 2.16.2: FBHVS Component Table Provide a component table for fuel building pressure differential indicators that include information for the Tag Numbers, Display status, and Control Function status.
14.3-47	Raval J Walker H	Provide an FBHVS equipment table that includes specified information	DCD Tier 1, Revision 1, Section 2.16.2: FBHVS Equipment Table Provide an equipment table for FBHV system supply, return/exhaust and standby exhaust fans that include the information for Tag Numbers and Component Location.
14.3-48	Raval J Walker H	Provide an ITAAC table for FBHVS that includes the specified information	DCD Tier 1, Revision 1, Section 2.16.2: FBHVS ITAAC Table Provide an ITAAC table consisting of Design Commitments and their associated Inspection, Test, Analyses and Acceptance Criteria as follows in addition to the line Items identified in Table 2.16.2-3:

RAI Number	Reviewer	Question Summary	Full Text
			A. Provide a line item in the Design Commitment column to state that FBHVS maintains fuel building at a minimum negative pressure of 62 Pa (-1/4 inch W.G.) relative to surrounding areas. B. Provide a line item(s) in the Inspection, Test, Analyses column; it should state as follows: i) Testing will be performed to confirm that the FBHVS maintains a minimum negative pressure of 62 Pa (-1/4 inch W.G.) when operating all FBHVS supply AHUs and all FBHVS exhaust fans. ii) Testing will be performed to confirm the ventilation flow rate through the fuel building area when operating all FBHVS supply AHUs and all FBHVS exhaust fans. C. Provide a line item(s) in the Acceptance Criteria column. It should state as follows: i) The time average pressure differential in the served areas of the fuel building as measured by the pressure differential indicators (provide Equipment Table Number where these indicators are shown) is a minimum of 62 Pa (-1/4 inch W.G.). ii) A report exists and concludes that the calculated exhaust flow rate based on the measured flow rate is greater than or equal to the FBHVS supply flow rate (provide data).
14.3-49	Raval J Walker H	Provide revised system flow diagrams for FBHVS that include the specified information	DCD Tier 1, Revision 1, Section 2.16.2: FBHVS ITAAC Figure Provide revised system flow diagrams that consist of major components and equipment, as described in the above FBHVS tables including major instrument details with Tag Numbers, and flow and sizing data. Also, clarify why DCD Tier 1 Figure 2.16.2-7, “CBGAHVS (Set B) Simplified System Diagram,” and Figure 2.16.2-8, “FBGAHVS Simplified System Diagram,” show identical areas being served by two different unrelated HVAC systems. And, revise FBGAHVS figure, as needed.

RAI Number	Reviewer	Question Summary	Full Text
14.3-50	Raval J Walker H	Provide a concise general Design Description describing the function of radwaste building HVAC system	DCD Tier 1, Revision 1, Section 2.16.2: Radwaste Building HVAC (RWBHVAC) System The RWBHVACS is a stand-alone system as described in DCD Tier 2 Section 9.4.3. Provide a concise general Design Description describing the function of radwaste building HVAC system as described in DCD Tier 2, Revision 1, Section 9.4.3. Also address the following system functions: - Radwaste building is maintained at a slight negative pressure relative to adjacent areas and outside atmosphere to prevent the exfiltration of air to adjacent areas; - The radwaste building exhaust is monitored prior to discharging it through the plant vent stack. Also, address radiation monitoring in the text and figure of I.e., Tier 2, Revision 1, Section 9.4.3, as needed.
14.3-51	Raval J Walker H	Revise the Design Description for TBHVS to include the specified information	DCD Tier 1, Revision 1, Section 2.16.2: Turbine Building HVAC (TBHV) System The TBHV system is a stand-alone system as described in DCD Tier 2 Section 9.4.4. Revise the Design Description to state (In addition to the existing description under DCD Tier 1 Section 2.16.2) as follows: - Turbine building exhaust is directed to the plant vent stack where it is monitored for radiation prior to being discharged to the atmosphere, as described in DCD Tier 2, Revision 1, Section 9.4.4. - TBHV system is designed to minimize exfiltration of air to adjacent areas by maintaining a slightly negative pressure in the turbine building (by exhausting more air than is supplied to the turbine building) relative to adjacent areas.

RAI Number	Reviewer	Question Summary	Full Text
14.3-52	Raval J Walker H	Revise Tier 1 materials for RBHVS to include the specified information	DCD Tier 1, Revision 1, Section 2.16.2: Reactor Building HVAC System (RBHVS) Design Description Revise Tier 1 materials for RBHVS to provide additional information concerning the Design Description, equipment tables, ITAAC table, and system figure with the related system details (in addition to the existing materials under DCD Tier 1, Revision 1, Section 2.16.2). Address the following information in the "Design Description" for RBHVS in order for the staff to complete its review: A. Include cross-referencing the associated ITAAC Table and tables for system equipment, ducting, piping, and associated controls, as identified in RAIs 14.3-53, 14.3-54, and 14.3-55. B. Provide the information on ASME Code classification and seismic classification, for the design and construction of components (such as safety-related building isolation dampers and ducting (piping)) penetrating the reactor building boundary. C. Provide system functions to (1) maintain the reactor building at a minimum negative pressure with respect to the adjacent areas to minimize the exfiltration of potentially contaminated air and (2) maintain hydrogen concentration levels in the battery rooms below 1% by volume, and (3) monitor the reactor building exhaust for radiological contamination prior to discharge to the plant vent stack.
14.3-53	Raval J Walker H	Provide RBHVS component table(s) with the specified information	DCD Tier 1, Revision 1, Section 2.16.2: RBHVS Component Tables Provide information in a tabulated format concerning the associated instrumentation and controls that provide the reactor building isolation based upon isolation signals, maintain reactor building at a minimum negative pressure with respect to the adjacent areas to minimize exfiltration of outside air based upon the differential pressure indicators, and detect radiation activity prior to release to plant vent stack based upon the radiation monitors.

RAI Number	Reviewer	Question Summary	Full Text
14.3-53 (cont.)			Provide a table for isolation dampers (valves) for reactor building contaminated area HVAC subsystem (CONAVS), refueling and pool area HVAC subsystem (REPAVS), and reactor building clean area HVAC subsystem (CLAVS), that include the information for Tag Numbers, ASME Code Section status, Seismic Category I classification, Remotely Operated Valve status, Class 1E/Qualification for Harsh Environment status, Safety Related Display valve position status, Control status, Active Function status, and Loss of Motive Power Position status.
14.3-54	Raval J Walker H	Provide RBHVS equipment table(s) that include specified information	DCD Tier 1, Revision 1, Section 2.16.2: RBHVS Equipment Table Provide a table for supply and exhaust air ducting/piping for CONAVS and REPAVS (RBHVS subsystems) that include information for Tag Numbers, ASME code section status, and "Functional Capability Required" status. Also provide a table for CONAVS air handling units (AHUs) and exhaust fans, RBHVS purge exhaust filter units and exhaust fans, REPAVS AHUs and exhaust fans that include information for Tag Numbers, Display run status, and Control Function indicating Start or Run status, as appropriate.
14.3-55	Raval J Walker H	Revise the RBHVS ITAAC table including specified information	DCD Tier 1, Revision 1, Section 2.16.2: RBHVS ITAAC Table Revise the ITAAC table consisting of "Design Commitments" and their associated "Inspection, Test, Analyses" and "Acceptance Criteria" as follows in addition to the items identified in Table 2.16.2-1: A. Provide line item(s) in the Design Commitment column to state that the CONAVS and REPAVS maintain served areas the of reactor building at a minimum negative pressure (e.g., 62 Pa (-1/4 inch W.G.)) relative to surrounding clean areas to minimize the exfiltration of potentially contaminated air. B. Provide line item(s) in Inspection, Test, Analyses column for CONAVS to state as follows:

RAI Number	Reviewer	Question Summary	Full Text
14.3-55 (cont.)			i) Testing will be performed to confirm that the contaminated areas of reactor building served by CONVAS maintain a minimum negative pressure of (e.g., 62 Pa (-1/4-inch W.G.)) when operating all CONAVS supply and exhaust fans. ii) Testing will be performed to confirm the ventilation flow rate through the contaminated areas of reactor building served by CONVAS when operating all CONAVS supply and exhaust fan(s). C. Provide line items in the Acceptance Criteria column for CONAVS to state as follows: i) The time average pressure differential in the CONVAS served areas of the reactor building as measured by each of the pressure differential indicators (provide Equipment Table Number where these indicators are shown) is negative. ii) A report exists and concludes that the calculated exhaust flow rate based on the measured flow rate is greater than or equal to CONVAS supply flow rate (provide flow rate data). D. Provide line item in the Design Commitment column to state that the REPAVS maintains served areas of reactor building at a minimum negative pressure (e.g., 62 Pa (-1/4 inch W.G.)) relative to surrounding clean areas to minimize the exfiltration of potentially contaminated air. E. Provide line item(s) in the “Inspection, Test, Analyses” column should include a line item for REPAVS to state as follows: i) Testing will be performed to confirm that the refueling area of the reactor building served by REPAVS maintains a minimum negative pressure of (e.g., 62 Pa (-1/4 inch W.G.)) when operating all REPAVS supply and exhaust fans. ii) Testing will be performed to confirm the ventilation flow rate through the refueling area of reactor building served by REPAVS when operating all REPAVS supply and exhaust fans.

RAI Number	Reviewer	Question Summary	Full Text
14.3-55 (cont.)			F. Provide line item(s) in the Acceptance Criteria column for REPAVS to state as follows: i) The time average pressure differential in the REPAVS served areas of the reactor building as measured by each of the pressure differential indicators (provide Equipment Table Number where these indicators are shown) is negative. ii) A report exists and concludes that the calculated exhaust flow rate based on the measured flow rate is greater than or equal to REPAVS supply flow rate (provide flow rate data). DCD Tier 1, Revision 1, Section 2.16.2 states that REPAVS serves the refueling area of the reactor building while the same DCD Section implies that FBFPHV serves the spent fuel pool area. Clarify the differences of the areas being served by FBHVS as shown in Tier 1, Figure 2.16.2-9, "FBFPHV Simplified System Diagram" (Tier 2, Figure 9.4-6) and areas served by REPAVS as shown in Tier 1, Figure 2.16.2-3, "REPAVS Simplified System Diagram" (Tier 2, Figure 9.4-11).
14.3-56	Raval J Walker H	Provide revised RBHVS system flow diagrams	DCD Tier 1, Revision 1, Section 2.16.2: RBHVS ITAAC Figure Provide revised system flow diagrams that consists of major components and equipment with their Tag Numbers, as described in the above RBHVS tables including major instrument details and flow and sizing data.
14.3-57	Raval J Walker H	Address additional EBHVS information	DCD Tier 1, Revision 1, Section 2.16.2: Electrical Building HVAC System (EBHVS) Design Description Address additional information concerning the Design Description, equipment tables, including ITAAC table, and system figure with the related details. Address the following information in the Design Description for EBHVS in order for the staff to complete its review: - Provide cross-referencing of the associated EBHVS figures and tables including equipment and ITAAC tables for TSC HVAC subsystem and DG HVAC subsystem equipment, as identified in RAIs 14.3-58, 14.3-59, 14.3-60, 14.3-61, and 14.3-62.

RAI Number	Reviewer	Question Summary	Full Text
14.3-57 (cont.)			- Address the system functions to maintain the TSC at a positive pressure with respect to the adjacent rooms and outside environment to minimize the infiltration of potentially contaminated air and to maintain hydrogen concentration levels in the battery rooms to less than 2 percent by volume. The reactor building HVAC system maintains the hydrogen concentration level in the battery rooms below 1% by volume (as discussed in DCD Tier 2, Revision 1, Section 9.4.6). The electric and electronic rooms served by (EER) HVAC subsystem maintain the hydrogen concentration level to less than 2% by volume (as stated in Section 9.4.7). Provide justification for the variance in design criteria for hydrogen concentration levels in the above rooms citing the appropriate Code or Standard requirements (e.g., OSHA or others) and revise DCD Tier 2, Section 9.4.7.1 accordingly.

RAI Number	Reviewer	Question Summary	Full Text
14.3-58	Raval J Walker H	Provide an equipment table for the battery room exhaust fans that includes specified information	DCD Tier 1, Revision 1, Section 2.16.2: ERR HVAC Subsystem Equipment Table Provide an equipment table for the battery room exhaust fans that include information for Tag Numbers, Display run status, Control Function indicating Start or Run status, and component locations.
14.3-59	Raval J Walker H	Provide a TSCHVS equipment table with the specified information	DCD Tier 1, Revision 1, Section 2.16.2: TSC HVAC Subsystem Equipment Table Provide an equipment table for filtration units with supply fans (radiological mode of operation), air conditioning units (normal operation), kitchen exhaust fans, and pressure differential indicators that include information for Tag Numbers, Display run status, Control Function indicating Start or Run status, and component locations.
14.3-60	Raval J Walker H	Provide a DGHVS equipment table that includes the specified information	DCD Tier 1, Revision 1, Section 2.16.2: DG HVAC Subsystem Equipment Table Provide an equipment table for normal engine room AHUs, roof-mounted exhaust fans for supplementary ventilation, and electronic area AHUs that include information for Tag Numbers, Display run status, Control Function indicating Start or Run status, and component locations.

RAI Number	Reviewer	Question Summary	Full Text
14.3-61	Raval J Walker H	Provide EBHVS ITAAC table which includes the specified information	DCD Tier 1, Revision 1, Section 2.16.2: EBHVS ITAACTable Provide ITAAC table consisting of “Design Commitments” and their associated “Inspection, Test, Analyses” and “Acceptance Criteria” columns as follows: A. Provide the Design Commitment stating that the basic configuration of the EBHVS is as described in the Section (provide DCD Tier 1, Section Number). Also provide corresponding Inspection, test, Analyses column description stating that the inspections of the EBHVS configuration will be conducted. Also provide corresponding Acceptance Criteria column description stating that the as-built EBHVS conforms with the description in Section (provide DCD Tier 1, Section number). B. Provide a Design Commitment for maintaining positive pressure inside TSC areas. Provide details such as: the TSC HVAC subsystem maintains TSC at a slightly positive pressure (provide specific pressure differential data in English as well as in Metric Units) with respect to the adjacent rooms and outside environment to minimize the infiltration of contaminated air. Also provide corresponding “Inspection, Test, Analyses” detail stating that testing will be conducted (such as differential pressure testing and tracer gas testing in accordance with ASTM E741). Also provide corresponding Acceptance Criteria column details such as the time average pressure differential in the TSC areas is positive as measured by each of the pressure differential indicators (provide DCD Tier 1 equipment table number). C. Provide a concise description in the Design Commitment that describes the major areas served by the EER HVAC, TSC HVAC and DG HVAC subsystems to provide ventilation and/or cooling functions. Also provide corresponding details for the Inspection, Test, Analyses and Acceptance Criteria.
14.3-62	Raval J Walker H	Provide EBHVS system flow diagram that includes the specified information	DCD Tier 1, Revision 1, Section 2.16.2: EBHVS Figure Provide a system flow diagram that consists of major equipment (as described in the above equipment tables) and corresponding instrument details with their Tag Numbers and flow and sizing data.

RAI Number	Reviewer	Question Summary	Full Text
14.3-63	Raval J Walker H	Provide cross-referencing of the component tables for DSC equipment	DCD Tier 1, Revision 1, Section 2.16.2: Drywell Cooling System (DCS) Design Description Provide cross-referencing of the component tables for DSC equipment (e.g., fan coil units (FCUs), drywell temperature sensors, air or motor-operated dampers (if any), and associated controls), as identified in RAIs 14.3-64 and 14.3-65).
14.3-64	Raval J Walker H	Provide a DCS equipment table that includes the specified information	DCD Tier 1, Revision 1, Section 2.16.2: DCS Equipment Table Provide an equipment table for drywell temperature sensors that include information for Tag Numbers and Display status. Also provide an equipment table for DCS recirculation fan coil units that include Tag Numbers and Component Location.
14.3-65	Raval J Walker H	Provide a DCS ITAAC table that includes the specified information	DCD Tier 1, Revision 1, Section 2.16.2: DCS ITAAC Table Add an item as follows in addition to the line Item 1 in ITAAC Table 2.15.6-1: Provide a Design Commitment that states that displays of the parameters identified in tabulated form for the drywell temperature sensors (specify equipment table number) can be retrieved in the main control room. Also provide the corresponding details in Inspection, Test, Analyses and Acceptance Criteria stating that inspection will be conducted for retrievability of the parameters in the main control room and verifications will be made.
14.3-66	Raval J Walker H	Revise DCD Tier 1 Figure 2.15.6-1 to show DCS temperature sensors with the specified information	DCD Tier 1, Revision 1, Section 2.16.2: DCS ITAAC Figure Revise DCD Tier 1, Figure 2.15.6-1 to show DCS temperature sensors with their Tag Numbers and FCU Tag Numbers and flow and sizing data.
14.3-67	Jones S	Describe appropriate ITAAC related to key design features, controls, interlocks, and numerical performance	DCD Tier 1, Revision 1, Sections 2.5, 2.6, and 2.16 list inspections, tests, analyses, and acceptance criteria (ITAAC) related to fuel storage and handling systems. The staff has found the listed ITAAC incomplete with respect to the requirements of 10 CFR 52.47(a)(vi) for the following features:

RAI Number	Reviewer	Question Summary	Full Text
14.3-67 (cont.)		values for the fuel storage and handling systems.	1) Adequate cooling of fuel located in the inclined fuel transfer system. (GDC 61) 2) Numerical performance values for makeup to the IC/PCCS and SFP from the FPS and the offsite water sources. (GDC 61) 3) Numerical performance values for NPSH available, flow rates, and, heat removal rates for the various modes of FAPCS operation, including fuel pool cooling, low pressure coolant injection, containment spray,and suppression pool cooling. (GDC 34, 38, and 61) 4) Location and operating range of fuel storage pool level and temperature instrumentation. (GDC 63) 5) Verification that weirs and anti-siphon devices are installed at appropriate elevations to prevent inadvertent or accidental loss of fuel storage pool inventory below the minimum water level required for shielding. (GDC 61) 6) Verification that sumps, equipment drains, and leakage collection devices are installed to prevent undetected releases of radioactive material to the environment, and verification that through-liner leakage can be captured or adequate makeup can be provided to prevent a significant reduction in coolant inventory. (GDC 61) 7) Test of interlocks preventing movement of heavy loads over stored fuel. (GDC 4) 8) Inspections to verify key features necessary to conform to NUREG-0554 guidance and applicable industry standards have been correctly implemented for refueling machine, fuel handling machine, RB crane, and FB crane. (GDC 4) 9) Inspections and load tests of special lifting devices as specified in Tier 2. (GDC 4) Describe appropriate ITAAC related to key design features, controls, interlocks, and numerical performance values for the fuel storage and handling systems.

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14.3-69	Li C	Provide system schematic and ITAAC for the PSWS in DCD Tier 1.	Plant Service Water System (PSWS) is included in the DCD Tier 1, Revision 1. However, it does not include the a system drawing, or an inspection, test and analyses, and acceptance criteria (ITAAC) table. Provide a simplified schematic of the PSWS system in DCD Tier 1, Section 2.12.7 and provide proposed ITAACs.
14.3-70	Li H	The "Design Description" section and the Table for ITAAC number should have correspondent relation.	The "Design Description" section in DCD Tier 1 is the abstract of the system described in DCD Tier 2. The ITAAC Table listed design commitments are required to be verified by the NRC before the COL licensee can load the fuel. The staff needs to verify every item in the ITAAC table to assure that the essential portions of the system have been verified. It is suggested that the "Design Description" section has the same numbering system as the ITAAC table numbers.
14.3-71	Li H	The ITAAC table "Acceptance Criteria" column should not only state "the certified design commitment is met."	In the ITAAC Table the "Design Commitment" column may contain many sub-numbered items. The "Acceptance Criteria" column should list all those sub-numbers corresponding to each Design Commitment item and discuss what type of document will be available for the staff to verify. It is not acceptable to state that "the certified design commitment is met." This type of blanket statement is difficult to verify under provision of 10 CFR 52.103(g). The acceptance criteria should be objective and unambiguous, in order to prevent misinterpretation.
14.3-72	Li H	Clarify the statement that "the ATWS logic cards of Safety System Logic and Control (SSLC) System," and discuss the interface between the ATWS system, the SSLC system, and the FWCS.	DCD Tier 1, Revision 1, Section 2.2.3 stated that upon receipt of an ATWS trip signal from the ATWS logic cards of Safety System Logic and Control (SSLC) System, FWCS initiates a runback of feedwater pump feedwater demand to zero and closes the LFCV and the RWCU/SDC overboard flow control valve. It is the staff's understanding that the SSLC is a safety-related system, while the ATWS logic is a non-safety-related system. Why does this Tier 1 document state that "the ATWS logic cards of Safety System Logic and Control (SSLC) System?" Discuss the interface between the ATWS system, the SSLC system, and the FWCS.
14.3-73	Li H	Identify specific acceptance criteria for item 4 of Table 2.2.3-2.	DCD Tier 1, Revision 1, Section 2.2.3, Table 2.2.3-2: In the Acceptance Criteria column, item 4 stated that "The certified design commitment is met." In the Design Commitment column, item 4 stated that "The FWCS configuration, monitored variables, trip functions and interfaces are as described in Section 2.2.3, Table 2.2.3-1 and Figure 2.2.3-1." This type of blanket statement is difficult to verify under provision of 10 CFR 52.103(g). The acceptance criteria should be objective and unambiguous, in order to prevent misinterpretation.

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14.3-74	Li H	Provide topical report for I&C system design process that includes all phases	DCD Tier 1, Revision 1, Section 3.2 stated that the ESBWR software life cycle process planning documents, based on Section 2.1 of BTP-14, were developed and submitted to the NRC for review in support of DCD certification. The applicant should provide an overview of the ESBWR I&C system design process that includes the planning phase, the implementation phase, and the product output phase. The detailed interface with NRC inspection/verification checkpoints should be identified. The application document should address life cycle activities in the following three areas: **(1) Software Life Cycle Process Planning** 1. Software management plan 2. Software development plan 3. Software test plan 4. Software quality assurance plan 5. Integration plan 6. Installation plan 7. Maintenance plan 8. Training plan 9. Operations plan 10. Software safety plan 11. Software verification and validation plan 12. Software configuration management plan

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14.3-74 (cont.)			**(2) Software Life Cycle Process Implementation** 1. Safety analyses 2. Verification and validation analysis and test reports 3. Configuration management reports 4. Requirement traceability matrix One or more sets of these reports should be available for each of the following activity groups: 1. Requirements 2. Design 3. Implementation 4. Integration 5. Validation 6. Installation 7. Operations 8. Maintenance

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14.3-74 (cont.)			**3. Software Life Cycle Process Design Outputs** 1. Software requirements specifications (SRS) 2. Hardware and software architecture descriptions (SAD) 3. Major hardware component description and qualifications 4. Software design specifications (SDS) 5. Code listings 6. System Build documents 7. Installation configuration tables 8. Operations manuals 9. Maintenance manuals 10. Training manuals The application should address the computer system development process, which typically consists of the following computer lifecycle phases: • Concepts • Requirements • Design • Implementation • Test • Installation, Checkout and Acceptance Testing • Operation • Maintenance • Retirement

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14.3-74 (cont.)			The activities during the lifecycle phases are summarized as: • Creating the conceptual design of the system, translation of the concepts into specific system requirements • Using the requirements to develop a detailed system design • Implementing the design into hardware and software functions • Testing the functions to assure the requirements have been correctly implemented • Installing the system and performing site acceptance testing • Operating and maintaining the system • Retiring the system Standard Review Plan BTP 7-14, Revision 4 - June 1997, describes the characteristics of a software development process that the NRC staff evaluates when assessing compliance with the quality criteria of the Clause 5.3 “Quality” of IEEE Std 7-4.3.2-2003. Update DCD Tier 1 Section 3.2, “Software Development,” to include all life cycle activities. This topical report should be part of Tier 2* material. Any change to Tier 2* documents should be approved by NRC.
14.3-75	Li H	Identify the digital I&C system design development process activities and the COL action requirements.	The digital I&C system design development process, as documented in the certified design’s DCD should be addressed to the greatest extent possible in the COL application. Some activities can be performed during pre-COL application stage, some activities can only be performed after equipment is purchased and tested. Therefore, the software development ITAAC should clearly identify which activities will be perform before COL license stage, and which activities will be performed after COL license. For those activities to be performed by the COL licensee, the COL action requirements should be specified in the DCD.
14.3-76	Beacom R	Define what is meant by a Dedicated Operators Interface (DOI) in Tier 1, Table 2.2.1-1, Design Commitment No. 12.	DCD Tier 1, Revision 1, Table 2.2.1-1: Please provide a detailed explanation of the term “Dedicated Operators Interface” (DOI). This should include if this can be a specific hardware device, dedicated display terminal, a page on a display, an element or section of a particular display page, etc. The explanation should also include the possible types of signal connections to the device or displays. Also why this particular entity is used in the RC&IS system only.

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14.3-78	Beacom R	In Tier 1, Figure 2.1.2-4 NBS Water Level Instrumentation" should provide additional attributes of each level function.	DCD Tier 1, Revision 1, Figure 2.1.2-4, Nuclear Boiler System Water Level Instrumentation should provide the number of level transmitters used for each range, number of transmitters used per division and which transmitters/ ranges are safety related.
14.3-79	Beacom R	In Tier 1, Section 2.1.2, description does not identify information for reactor vessel metal temperature and pressure	DCD Tier 1, Revision 1, Section 2.1.2, the Nuclear Boiler System description does not identify the numbers, locations and safety related status of these sensors: • Reactor Pressure Vessel Pressure • Reactor Pressure Vessel Temperature (and metal temperature) • Drywell Pressure • Main Condenser Vacuum • Turbine Inlet Pressure
14.3-80	Beacom R	In Tier 1, Section 2.1.2, Nuclear Boiler System, there are no physical separation criteria for Class 1E components	DCD Tier 1, Revision 1, Section 2.1.2, Nuclear Boiler System, should identify guidelines for identification and physical separation of Class 1E electrical equipment. ITAAC should be created for inspections of Class 1E raceways from the main control room through other areas of the plant. The scope of this inquiry is limited to instrumentation and control (limited energy content cables). However, this should include separation between Class 1E divisions and non Class 1E equipment.
14.3-81	Beacom R	Provide a list of RC&IS input and output signals to be used for ITAAC Table 2.2.1-1	The Design Description of the RC&IS should provide a listing of the plant input signals, and output signals, to the RC&IS. Provide an ITAAC to verify each signal is present when confirming channel redundancy, channel protective action independence and two channel agreement during RC&IS operations.
14.3-82	Beacom R	Show HCU Charging Header Pressure Instrumentation on Figure 2.2.2-1	Please revise DCD Tier 1, Figure 2.2.2-1, Control Rod Drive System, to show the HCU Charging Header pressure instrumentation.

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14.3-83	Beacom R	Provide the necessary I&C design information	Neither the Standby Liquid Control System design description, nor the P&ID for the system, Figure 2.2.4.1, provides the necessary information which ITAACs No.1, basic configuration of SLC System, and No. 8, Control Room alarms, indications and controls, require. Some of the information is provided in Section 7.4.1.2. The information in Tier 1 should include the following: • The redundancy and logic numbers of the level, pressure and alarm indications • A description of how the alarms, such as the low level alarms, are set to provide adequate time for recharging nitrogen and sodium pentaborate solution supply systems. • Other parameters which are monitored such as nitrogen gas and poison solution makeup (not shown on Figure 2.2.4.1) • Status indications for pumps, injection valves and suction valves • Controls such as for the pumps, injection and suction valves and the manual initiation switches for the system.
14.3-84	Beacom R	Specific ITAACs required for SLC system, Tier 1 Table 2.2.4-2	The following ITAAC should be added to Table 2.2.4-2, ITAAC For The Standby Liquid Control System: 13. Existing ITAAC in the SLC does not check for the flow rate of the as built SLC system into the RPV. This design commitment should also identify the reactor pressure at which the flow rate is delivered. 14. Manual initiation of the SLC from the main control room 15. Both divisions of the SLC system are automatically initiated during an ATWS event.

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