Jeff Ciocco

From: Jeff Ciocco
Sent: Monday, July 21, 2008 2:55 PM
To: us-apwr-rai@mhi.co.jp
Cc: Andy duBouchet; Juan Peralta; Ngola Otto; Larry Burkhart; Harrison Botwin; Jeff Ciocco
Subject: US-APWR Design Certification Application RAI No.33
Attachments: US-APWR DC RAI 33 CQVP 651.pdf

MHI,

Attached please find the subject request for additional information (RAI). This RAI was sent to you in draft form. The schedule we are establishing for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. However, as you have requested, you are granted 45 days to respond to RAI 33. Please submit your RAI response to the NRC Document Control Desk.

Thanks,

Jeff Ciocco
Office: T-7F14
New Reactor Licensing
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2739
301.415.6391
jeff.ciocco@nrc.gov

REQUEST FOR ADDITIONAL INFORMATION NO. 33 REVISION 0

7/21/2008

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 14.02 - Initial Plant Test Program - Design Certification and New License Applicants

Application Section: 14.2 Initial Plant Test Program

CQVP Branch

QUESTIONS

14.02-25

RG 1.68, App. C.3, "Initial Criticality Procedures," cautions that "a critical rod position (boron concentration) should be predicted so that any anomalies may be noted and evaluated" prior to initial criticality. DCD Section 14.2.10.2 does not include this precaution in the list of conditions that need to exist prior to initial criticality. Please include this precaution in DCD Section 14.2.10.2.

(BNL RAI 14.2-9, Part C)

14.02-26

RG 1.68, App. C.3, "Initial Criticality Procedures," cautions that "high-flux scram trips should be set at their lowest value (approximately 5% - 20%)" prior to initial criticality. DCD Section 14.2.10.2 does not include this precaution in the list of conditions that need to exist prior to initial criticality. Please include this precaution in DCD Section 14.2.10.2..

(BNL RAI 14.2-9, Part D)

14.02-27

RG 1.68, App. A.2.d, "Initial Fuel Loading and Precritical Tests," indicates that a "final test of the reactor coolant system to verify that system leak rates are within specified limits" should be conducted prior to initial criticality. DCD Section 14.2.10.2 does not include this prerequisite in the list of conditions that need to exist prior to initial criticality. Please include this prerequisite in DCD Section 14.2.10.2.

(BNL RAI 14.2-9, Part E)

14.02-28

RG 1.68, App. A.3, "Initial Criticality," states that "all systems required for startup or protection of the plant, including the reactor protection system and emergency shutdown system, should be operable and in a state of readiness." prior to initial criticality. DCD Section 14.2.10.2 does not include this prerequisite in the list of conditions that need to exist prior to initial criticality. Please include this prerequisite in DCD Section 14.2.10.2.

(BNL RAI 14.2-9, Part F)

14.02-29

RG 1.68, App. A, includes verification of operation of the alarms for many systems. In the DCD, verification of the operation of alarms in different systems is not consistently addressed. In some system preoperational tests, verification of alarms and functional indications is included. However, such verification is not included in other test abstracts of the DCD. For example, CVCS Preoperational Tests described in Sections 14.2.12.1.12 to 14.2.12.1.14 do not include any tests relating to the verification of alarms in the system. However, water levels in the Volume Control Tank, Boric Acid Tank and the Holdup Tank have associated alarms. Please review all test abstracts in Section 14.2 to include provisions for verification of operation of alarms, as appropriate.

(BNL RAI 14.2-20)

14.02-30

RG 1.68, App. A, Section 1.h(10) calls for a preoperational test of the Ultimate Heat Sink. This test is in the startup test program for the US-APWR as test 14.2.12.2.4.21. Please provide justification for not testing the Ultimate Heat Sink during the preoperational phase, or revise Section 14.2 to include it.

(BNL RAI 14.2-21)

14.02-31

DCD Section 14.2.12.1.1 addresses the RCS Hot Functional Preoperational Test.

A. Prerequisites: Please add that all systems to be operated have completed cold functional testing. Add specifications for RCS and secondary water quality.

B. Please specify the actual temperatures at which the test will be performed. Specify the expected and maximum heatup and cooldown rates.

C. Also, Objective A.2 and Acceptance Criterion D.2 relate that this test is used to coordinate preoperational tests of other systems that require hot temperatures. Since this procedure is the coordinating mechanism, these other tests should be listed here.

D. Please dd the following to the Test Method Section:

Perform inspections for leakage.

- Demonstrate the capability to control the RCS under solid conditions (no pressurizer bubble) both cold and hot.
- Include temperature and pressure plateaus to be used.
- Include provisions to perform trial applications of plant operating procedures and to keep track of recommended changes.
- Provide for the hot ECCS testing of RG 1.79: C.1.a.(2) – SI Hot Flow test; C.1c.(3) – Accumulator Hot Flow Test; C.2.b.(3) Valve operability at maximum expected temperatures.

(BNL RAI 14.2-22)

14.02-32

DCD Section 14.2.12.1.3, RCP Initial Operation Preoperational Test, refers to DCD Section 5.4.1 for RCP design specifications. The RCP is a complex pump with many subsystems that should be tested, and that are not listed in the test abstract. Examples from Section 5.4.1 include:

- RCPs provide design flow rate to the reactor vessel (5.4.1.2)
- RCPs provide adequate flow rate during coastdown on a LOOP and there is adequate natural circulation to cool the core (5.4.1.2)
- Design seal injection rates are obtained (5.4.1.3.2)
- Thermal barrier HX provides adequate cooling on loss of seal injection (5.4.1.3.2)
- CCW cooling to bearings is adequate (5.4.1.3.2)
- Oil spillage protection system functions as designed (5.4.1.3.2)
- All instrumentation functions (e. g., RTDs, seal injection flow, CCW flow) (5.4.1.3.2)
- Anti-rotation device is functional (5.4.1.3.2)
- Motor air cooling and CCW are functional (5.4.1.3.2)
- RCP frame vibration is acceptable (5.4.1.3.2)
- CCW cooling is adequate on a loss of seal injection (5.4.1.3.3)
- Seal injection provides adequate cooling on loss of CCW (5.4.1.3.4)
- Seal leak-off values are acceptable (5.4.1.4.1 and 5.4.1.4.9)

Please revise DCD Subsection 14.2.12.1.3 to address the above RCP test requirements.

(BNL RAI 14.2-23)

14.02-33

DCD Section 14.2.12.1.5 describes the Pressurizer Relief Tank (PRT) test. DCD Sections 14.2.12.1.4 and 14.2.12.1.6 test the SDVs and RVs. The PRT test does not

verify proper PRT operation upon relief valve or SDV operation, which is its main function. Please revise DCD Subsection 14.2.12.1.5 to verify proper PRT operation on relief valve or SDV operation.

(BNL RAI 14.2-24)

14.02-34

DCD Sections 14.2.12.1.4 and 14.2.12.1.6 test the SDVs and RVs respectively. Neither test abstract mentions clearly that both SDVs and all 4 RVs will be tested. Also, RG 1.68, App. A, Item 1.a(2)(d) calls for a check of the "pressure relief valves ... supports and restraints for discharge piping." This should be done after the valves have actuated and relieved. Please address the above test requirements in the referenced DCD test abstracts.

(BNL RAI 14.2-25)

14.02-35

DCD Section 14.2.12.1.7, Reactor Internals Vibration Test, refers to RG 1.20, "Comprehensive Vibration Assessment Program for Reactor Internals during Pre-operational and Initial Startup Testing," in a footnote. DCD Table 1.9.1-1 commits to RG 1.20 with no exceptions. The test in DCD Section 14.2.12.1.7 should specifically reference and incorporate RG 1.20 for test methodology and acceptance criteria as appropriate. The DCD should also note that the RCOL will be designated and tested as a prototype per RG 1.20. Further, upon successful qualification of the RCOL as a valid prototype, the SCOL plants will be designated and tested as Non-Prototype Category I, per RG 1.20. Please revise DCD Section 14.2.12.1.7 to incorporate the above RG 1.20 guidance. Also, MHI needs to identify any COL Actions Item(s) as part of its response to this request for additional information.

(BNL RAI 14.2-26, Part A)

14.02-36

DCD Section 14.2.8.1.1 notes that the Reactor Internals Vibration Test is conducted only during the hot functional test, prior to fuel loading, because the vibration responses under normal operating conditions with core are predicted to be almost the same or slightly lower than those under hot functional tests without the core loaded. This does not seem to be in accordance with RG 1.20, although no exception is specifically cited. RG 1.20 clearly includes activities for post fuel load and during the power ascension phase. Please revise DCD Subsection 14.2.8.1 to address activities for post fuel load and during the power ascension phase consistent with RG 1.20 guidance.

(BNL RAI 14.2-26, Part B)

14.02-37

RG 1.68, App. A section 1.a(3) calls for preoperational vibration tests of reactor internals and RCS components such as piping and rotating components. DCD Table 14A-1, Conformance Matrix of RG 1.68, Row 1.a(3) states that a vibration test of the RCS piping is not needed since vibration is low. The purpose of the test is to confirm that fact. Please provide additional information in the DCD to justify this exception to RG 1.68 or ortherwise revise Section 14.2 accordingly.

(BNL RAI 14.2-26, Part C)

14.02-38

DCD section 14.2.12.1.9, Item B.4 on page 14.2-37 needs to be clarified. This may be a typographical error.

(BNL RAI 14.2-27)

14.02-39

DCD Section 14.2.12.1.10, Acceptance Criteria D.1 on page 14.2-38 refers to section 7.7.1.3 of the DCD for proper generator phasing information, but none is provided. Please include this additional information in the DCD.

(BNL RAI 14.2-28)

14.02-40

DCD Section 14.2.12.1.12, Chemical and Volume Control System (CVCS) Preoperational Test – Boric Acid Blending does not include a test on the operation of heaters and heat tracing. RG 1.68 1.b. (2) Chemical Control System Tests includes verification of operation of heaters and heat tracing. As stated in Chapter 9.3.4.3 of the DCD, the CVCS is designed to ensure that the boric acid solution remains soluble. Heat

tracing or a heated area with temperature alarms are provided for portions of the system which normally contain 4 wt. % of boric acid solution, to assure that boric acid solution temperature does not go below 65 °F. Please discuss the testing for the heaters and heat tracing and include in the DCD, as appropriate.

(BNL RAI 14.2-29)

14.02-41

DCD Section 14.2.12.1.12, Chemical and Volume Control System (CVCS) Preoperational Test – Boric Acid Blending does not include a test demonstrating the correct failure mode on loss of power to system components. RG 1.68 1.b. (2) Chemical Control System Tests includes demonstration of correct failure mode on loss of power to system components. Table 9.3.1-1, Safety-Related Air Operated Valve, provides the loss of power position of the AOVs in the CVCS. Please discuss how the loss of power position of the CVCS components is being demonstrated and include appropriate tests in the DCD.

((BNL RAI 14.2-30)

14.02-42

DCD Section 14.2.12.1.15, addresses the Lithium Addition and Distribution Test. Test method step C.3 is unclear as written, please clarify. There is only one acceptance criterion and it addresses uniform distribution of Lithium. Please add a criterion for proper operation of the Lithium Addition components/system into DCD Section 14.2.12.1.5.

(BNL RAI 14.2-31)

14.02-43

DCD Section 14.2.12.1.16, PMWS Preoperational Test, Item B. Prerequisites does not include the availability of Demineralized Water Storage Tank (DWST) and Demineralized Water Transfer Pumps. DWST and the transfer pumps supply demineralized water to the Primary Makeup Water Tanks. To conduct the preoperational tests for the PMWS, DWST and the transfer pumps should be available. Please discuss and address the availability of DWST and demineralized water transfer pumps for the prerequisites for PMWS preoperational tests in DCD Subsection 14.2.12.1.16.

(BNL RAI 14.2-32)

14.02-44

Section 14.2.12.1.17, Rector Trip System and ESF System Response Time Test, presents the test method and acceptance criterion in terms of the total reactor trip

system and total ESF system response times. RG 1.68 1.c guidance is to verify (by testing) the response time of each of the protection channels, including sensors. Please discuss and modify the DCD to address, as appropriate, the testing of the response time of each of the protection channels including sensors in the Reactor Trip and ESF systems.

(BNL RAI 14.2-33)

14.02-45

DCD 14.2.12.1.18: Reactor Trip System and ESF System Logic Preoperational Test calls for the use of an engineering tool for validating the software in the ESF and reactor trip systems. The acceptance criterion D.1 is that the results of this test method are "Good." Please include additional information in DCD Subsection 14.2.12.1.8 for determining the adequacy of the test results.

(BNL RAI 14.2-34)

14.02-46

DCD 14.2.12.1.19: RTDs/TCs cross calibration test, refers to DCD Subsection 7.7.1.1 and BTP-HICB-13 for acceptance criterion D.1.; Subsection 7.7.1.1 does not provide any information regarding acceptability of the RTDs. The referenced Branch Technical Position (HICB-13) does not give specific tolerances as inferred by this acceptance criterion. Please revise Subsection 7.7.1.1 to provide information regarding acceptability of the RTDs.

Acceptance Criterion D.2 uses the terminology "approximately" to determine acceptable measurements. Please revise DCD Subsection 14.2.12.1.19 to be more specific regarding the acceptable tolerance.

(BNL RAI 14.2-35)

14.02-47

Section 14.2.12.1.21, Main Steam Supply System Preoperational Testing, discusses the testing for relief valves, turbine bypass valves, and main steam safety valves. The section of the DCD does not discuss the testing for the main steam relief valve block valve. Please include the testing for the main steam relief valve block valve in DCD Subsection 14.2.12.1.21.

(BNL RAI 14.2-36, Part A)

14.02-48

Section 14.2.12.1.21, Main Steam Supply System Preoperational Testing, discusses the testing for relief valves, turbine bypass valves, and main steam safety valves. In this section, the terminology of power-operated atmospheric relief valve and motor-operated relief valve is used. However, in Section 10.3.2 of the DCD, these valves are referred to as main steam relief valve and main steam depressurization valve. Please use consistent terminology in both subsections of the DCD.

(BNL RAI 14.2-35, Part B)

14.02-49

RG 1.68 App. A, Section 1.d(9) calls for preoperational testing of the Condensate Storage System. For item 1.d(9), DCD Table 14A-1 references Test abstracts 14.2.12.1.24 & .25 for the EFW System, but these do not address condensate storage, which is addressed in Subsection 14.2.12.1.109. Please correct DCD Table 14A-1.

(BNL RAI 14.2-37)

14.02-50

The acceptance criterion for DCD 14.2.12.1.37 includes the instrument 120 V ac system, however that system is not described in DCD Subsection 8.3.1.1.1 as stated. Please clarify and provide appropriate acceptance criteria for the 120 V ac system in DCD Subsection 14.2.12.1.37.

(BNL RAI 14.2-38)

14.02-51

DCD 14.2.12.1.41 includes a reference to Technical Specification (TS) SR 3.8.9.1. TS SR 3.8.8.1 (inverter voltage, frequency, and alignment) is also relevant to this test. Please include TS SR 3.8.8.1 as part of the acceptance criteria in DCD Subsection 14.2.12.1.41.

(BNL RAI 14.2-39)

14.02-52

DCD 14.2.12.1.44 describes the preoperational test for the Gas Turbine Generator. Included are objectives associated with the electrical, mechanical, and logic subsystems. However, not all of the objectives are reflected in the test methods and acceptance criteria as follows:

Objective A.6 is to verify that all generator trip signals are bypassed with a safety injection signal. However, test method C.7 calls for a simulated loss of offsite power to

verify the emergency generator trips and bypasses but not a safety injection signal. Please provide additional information in DCD Subsection 14.2.12.1.44 to implement Objective A.6 of the test.

(BNL RAI 14.2-40, Part A)

14.02-53

DCD 14.2.12.1.44 describes the preoperational test for the Gas Turbine Generator. Included are objectives associated with the electrical, mechanical, and logic subsystems. However, not all of the objectives are reflected in the test methods and acceptance criteria as follows:

Objective A.2 is related, in part, to verifying the proper operation of the fuel oil storage and transfer system (FOS). Test methods C.1 and C.6 discuss this attribute, but there is no acceptance criterion that validates the safety functions for the FOS that are described in Section 9.5.4.1 of the DCD. Please revise DCD Subsection 14.2.12.1.44 to document the acceptance criterion that validates the safety functions for the FOS as described in Section 9.5.4.1 of the DCD.

(BNL RAI 14.2-40, Part B)

14.02-54

DCD 14.2.12.1.44 describes the preoperational test for the Gas Turbine Generator. Included are objectives associated with the electrical, mechanical, and logic subsystems. However, not all of the objectives are reflected in the test methods and acceptance criteria as follows:

Table 1 in Regulatory Guide 1.9 lists tests that should be conducted during the pre-operational test phase. These tests include a load rejection and hot restart. RG 1.9 is not referred to in DCD Subsection 14.2.12.1.44, nor are these tests identified as part of the test method. (Reg. Guide 1.9 is listed in DCD Section 8.3.1.2.2 and in Table 1.9.1-1 as being applicable and as being used for the gas turbine generators). Please provide additional information in DCD Subsection 14.2.12.1.44 to reference RG 1.9 and to incorporate the appropriate tests identified in the RG.

(BNL RAI 14.2-40, Part C)

14.02-55

Acceptance criterion D.2 of DCD Subsection 14.2.12.1.46 is not worded properly (probably a typographical error). Please revise the wording.

(BNL RAI 14.2-41)

14.02-56

DCD Section 14.2.12.1.50, "Dynamic State Vibration Monitoring of Safety Related and High-Energy Piping," uses the phrases "specified transients" and "various plant transients." Please revise Subsection DCD Section 14.2.12.1.50 to include the list of specific transients that will be tested. In addition, please specify how the transients will be initiated.

(BNL RAI 14.2-42)

14.02-57

DCD Sections 14.2.12.1.50 and 14.2.12.1.51 address dynamic and steady state vibration monitoring, respectively. These tests should be very similar yet the test methods are different. For example, Section 14.2.12.1.50 does not include visual inspections. Please revise DCD Subsections 14.2.12.1.50 and 14.2.12.1.51 accordingly or justify the difference in test methods.

(BNL RAI 14.2-43)

14.02-58

DCD 14.2.12.1.53 has as an objective to demonstrate proper alignment and operation of ESF and other safety components with gas turbine maximum and minimum design voltages. The acceptance criteria require that the gas turbines function as designed and the ESF and other safety components actuate in the proper sequence and automatically align in the proper manner. There is no acceptance criterion identified to verify that all components operated properly under both maximum and minimum design voltages. Please revise DCD Subsection 14.2.12.1.53 to verify that all components operate properly under both maximum and minimum design voltages.

(BNL RAI 14.2-45)

14.02-59

Part A: Test Method C.2 in DCD Subsubection 14.2.12.1.56, "Safety Injection Check Valve Preoperational Test," presents the method for operability of accumulator discharge check valves. However, the test abstract does not specify testing of each of the 4 accumulator injection trains in accordance with RG 1.79, "Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors." RG 1.79 states that: "Each accumulator injection train should be tested individually or simultaneously by opening the isolation valve and then slowly..." Please provide additional information in DCD Subsection 14.2.12.1.56 to document that each injection train will be tested in accordance with the guidance in RG 1.79 and that the operability of the check valves will be demonstrated.

Part B: Test Methods C.1 and C.2 in DCD Subsection 14.2.12.1.56 discuss the operation of the accumulator discharge check valves and injection line check valves. It is not clear how the test methods described verify the operation of the accumulator

discharge check valves. Please revise DCD Subsection 14.2.12.1.56 to include a test method verifies the operation of the accumulator discharge check valves.

(BNL RAI 14.2-46)

14.02-60

Test Method C.3 in DCD Subsection 14.2.1.57, Safety Injection Accumulator Test, describes the accumulator discharge valve operation under maximum differential pressure conditions. RG 1.79, Preoperational Testing of ECCS for PWRs, Section C.1.c (2), states that this capability should be demonstrated for both normal and emergency power conditions. Neither the test method nor the acceptance criteria discuss the operability demonstration for both the normal and emergency power conditions. Please provide additional information in DCD Subsection 14.2.1.57 to indicate how accumulator discharge valve operation is demonstrated for both normal and emergency power conditions.

(BNL RAI 14.2-47)

14.02-61

Acceptance criterion D.2 for the containment spray system preoperational test in DCD Subsection 14.2.12.1.58 states that CS/RHRS pumps and CS system performance are within design limits without a discussion or reference to the specific design limits. Please provide additional information in DCD Subsection 14.2.12.1.58 to document the pump and system characteristics being tested and the associated design limits that should be met.

(BNL RAI 14.2-48)

14.02-62

DCD Subsection 14.2.12.1.58, Containment Spray System Preoperational Test, does not specifically discuss testing of the proper operation of CS/RHR system interlocks. RG 1.79 C.2.d.(2) states that performance data should be recorded and the proper operation of interlocks and equipment protective devices in pump and valve controls be verified. The CSS containment isolation valves are interlocked and are allowed to open only if two in-series RHR hot leg suction isolation valves are closed. Please provide additional information in DCD Subsection 14.2.12.1.58 to identify the preoperational tests that record performance data and verify the interlocks for the CS and RHR systems.

(BNL RAI 14.2-49)

14.02-63

DCD Subsection 14.2.12.1.58, Containment Spray System Preoperational Test, demonstrates the operation of the CS/RHRS pumps, CS system valves, and their

associated control circuitry. The CS/RHR system can be manually initiated and operated from the remote shutdown console (RSC). In addition, containment pressure and temperature are also indicated both in the main control room (MCR) and RSC. However, no preoperational test was identified relating to the verification of operability of CS system from the RSC.

Please provide additional information in the DCD to discuss how the operability of the CS system from the RSC will be verified. If the test is included in DCD Subsection 14.2.12.1.76, Remote Shutdown Preoperational Test, then please include appropriate wording either in DCD Subsection 14.2.12.1.58 or in DCD Subsection 14.2.12.1.76.

(BNL RAI 14.2-50)

14.02-64

RG 1.68, Appendix A, 1. h. (8), "Tanks and Other Sources of Water Used for ECCS," states that testing should include demonstration of proper operation of associated alarms, indicators, controls, heating and chilling systems, and valves.

DCD Subsection 14.2.12.1.59, "Refueling Water Storage System Preoperational Test," only addresses verification of control circuits and alarms. Further, the acceptance criterion in DCD Subsection 14.2.12.1.59 references DCD Subsection 6.3.2.2.4 for the refueling water storage pit (RWSP) system components controls. However, the RWSP system is also discussed in DCD Subsections 6.2.2.2.3 and 6.2.2.2.5, and the RWSP system instrumentation is briefly discussed in DCD Subsection 6.3.5.4.

Finally, DCD Subsections 6.2.2.2.3, 6.2.2.2.5 and 6.3.5.4 and Table 6.3-5 provide RWSP system specifications but do not provide any discussion of the alarms and their verifications.

Thereffore, MHI needs to revise DCD Subsection 14.2.12.1.59 to: (1) include demonstration of proper operation of systems and equipment within the scope of this test abstract; and (2) verify the accuracy of the acceptance criteria accordingly.

(BNL RAI 14.2-51)

14.02-65

The acceptance criterion presented in DCD Subsection 14.2.12.1.60, "Essential Chilled Water System Preoperational Test," states that: "The essential chilled water system operates as described in Subsection 9.2.7."

However, DCD Subsection 9.2.7 does not describe the acceptance criteria for the ECCS system in terms of the system function during normal conditions, and following receipt of an ECCS actuation signal. Also, the system and pump performance characteristics need to be specified.

(BNL RAI 14.2-52)

14.02-66

DCD Subsection 14.2.12.1.61, Containment Structural Integrity Test (SIT), refers to DCD Subsection 3.8.1 as providing the acceptance criterion for containment structural response. However, DCD Subsection 3.8.1.7, "Testing and Inservice Inspection Requirements," notes that:

"Structural integrity testing of the PCCV is performed in accordance with Article CC-6000 of the ASME Code, Section III (Reference 3.8-2), RG 1.35 (Reference 3.8-5), and RG 1.35.1 (Reference 3.8-6). The testing meets the same criteria requirements for ILRT and Containment Leakage Testing as given in RG 1.206 Subsection C.I.6.2.6 (Reference 3.8-1)."

Additionally, RGs 1.35 and 1.35.1 are listed in Table 1.9.1-1 of the DCD, but are not listed in Table 14.2-2 of the DCD.

Therefore, MHI needs to: (1) revise DCD Subsection 14.2.12.1.61 to include the performance of the prestressed concrete containment vessel SIT in accordance with these RGs and ASME code requirements as documented in DCD Subsection 3.8.1.7; (2) add RGs 1.35 and 1.35.1 to Table 14.2-2 of the DCD; and (3) verify that the SIT meets the applicable guidance in RG 1.68, Appendix A, Item 1.i.

(BNL RAI 14.2-53)

14.02-67

Acceptance criterion D.1 of DCD Subsection 14.2.12.1.66, "Reactor Cavity Cooling System Preoperational Test." references DCD Subsection 9.4.6.

DCD Subsection 9.4.6.1.2.3 documents two temperature limits that serve as a design basis for the system.

Please revise DCD Subsection 14.2.12.1.66 to document the verification of the temperature limits in DCD Subsection 9.4.6.1.2.3 during hot functional testing.

(BNL RAI 14.2-55)

14.02-68

Acceptance criterion D.1 of DCD Subsection 14.2.12.1.69, "Containment Fan Cooler System Preoperational Test," references DCD Subsection 9.4.6.

DCD Subsection 9.4.6.1.2.1 documents two temperature limits that serve as a design basis for the system.

Please revise DCD Subsection 14.2.12.1.69 to document the verification of the temperature limits in DCD Subsection 9.4.6.1.2.1 during hot functional testing.

(BNL RAI 14.2-56)

14.02-69

Acceptance criterion D.1 of DCD Subsection 14.2.12.1.71, "RCS Leak Rate Preoperational Test," references Technical Specification LCO 3.4.13. The RCPB leakage detection system is described in DCD Subsection 5.2.5.

Part A: DCD Subsection 5.2.5.1 notes, in part, that the RCPB leakage detection system is designed in accordance with RG 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems." RG 1.45 is listed in DCD Table 1.9.1-1, but is not listed in DCD Table 14.2-2. Please revise DCD Subsection 14.2.12.1.71 to reference RG 1.45, and add RG 1.45 to DCD Table 14.2-2.

Part B: DCD Subsection 14.2.12.1.71 only addresses 2 of the 4 RCS leakages in LCO 3.4.13 (items b and c). Please revise DCD Subsection 14.2.12.1.71 to add items a and d (no pressure boundary leakage and primary to secondary leakage less than 150 gpd) to the objectives, test method, and acceptance criteria sections of the test abstract.

Part C: The test method section of DCD Subsection 14.2.12.1.71 does not address all of the leakage detection methods in DCD sections 5.2.5.3 and 5.2.5.4. Please revise DCD Subsection 14.2.12.1.71 to add these additional leakage detection methods to the test abstract.

Part D: Neither DCD Subsection 5.2.5 nor DCD Subsection 14.2.12.1.71 identify quantitative methods for determining RCPB leakage rates for each of the several detection methods. The majority of these methods are qualitative. Please identify which leakage detection rates will be quantitative and which will be qualitative, and provide test step(s) in DCD Subsection 14.2.12.1.71 that will determine and correlate, as appropriate, the leakage results of the various methods.

(BNL RAI 14.2-57)

14.02-70

The objective of DCD Subsection 14.2.12.1.75 includes the demonstration of the nuclear instrumentation system to supply signals for operating the appropriate alarm and trip signals and indicating reactor power levels. The acceptance criteria for this test do not verify any nuclear instrumentation system output functions such as alarm, trip, or indication signals. Please revise DCD Subsection 14.2.12.1.75 to add acceptance criteria that verify any nuclear instrumentation system output functions such as alarm, trip, or indication signals.

(BNL RAI 14.2-58)

14.02-71

DCD Subsection 14.2.12.1.79 addresses the HEPA Filter and Charcoal Absorber Preoperational Test for four in-plant HVAC systems and refers to DCD Subsection 9.4. This subsection and Tables 1.9.1-1 and 14.2-2 commit to RG 1.52, which specifies, in part, initial test requirements for the HVAC systems. One of the four HVAC systems is the technical support center (TSC) HVAC, and DCD Subection 9.4.3.4.4 commits to RG 1.140 rather than RG 1.52 for the TSC. Section C.6 of each RG has guidance for testing, including "Initial in-place testing." Please revise DCD Subsection 14.2.12.1.79 to incorporate the test requirements of both RG 1.52 and RG 1.140, accordingly.

(BNL RAI 14.2-59)

14.02-72

DCD Subsection 14.2.12.1.80, "Liquid Waste Management System Preoperational Test," tests the capability of the LWMS as described in DCD Subsection 11.2. DCD Subsection 11.2.1.1 documents the design objectives of the LWMS.

However, DCD Subsection 14.2.12.1.80 does not seem to address the following design objectives of the LWMS documented in DCD Subsection 11.2.1.1: storage, sampling & analysis, treatment, recycle back to plant use, and release.

Please revise DCD Section 14.2.12.1.80 to address LWMS storage, sampling & analysis, treatment, recycle back to plant use, and release in the test abstract. Otherwise, please explain how these design objectives are being addressed by the test abstract.

(BNL RAI 14.2-60)

14.02-73

DCD Subsection 14.2.12.1.81, "Gaseous Waste Management System Preoperational Test," tests the capability of the GWMS as described in DCD Subsection 11.3. DCD Subsection 11.3.1.1 documents the design objectives of the GWMS.

However, DCD Subsection 14.2.12.1.81 does not seem to address the following design objectives of the GWMS documented in DCD Subsection 11.3.1.1: storage, sampling & analysis, treatment, reuse, and release.

Please revise DCD Section 14.2.12.1.81 to address GWMS storage, sampling & analysis, treatment, reuse, and release in the test abstract. Otherwise, please explain how these design objectives are being addressed by the test abstract.

(BNL RAI 14.2-61)

14.02-74

DCD Subsection 14.2.12.1.82, "Solid Waste Management System Preoperational Test," tests the capability of the SWMS as described in DCD Subsection 11.4. DCD Subsection 11.4.1.1 documents the design objectives of the SWMS.

However, the test method has only one step, "Verify alarms and indications." DCD Subsection 14.2.12.1.82 does not seem to address the following design objectives of the SWMS documented in DCD Subsection 11.4.1.1: processing, de-watering, solidification, storage, sampling & analysis, and packaging.

Please revise DCD Section 14.2.12.1.82 to address SWMS processing, de-watering, solidification, storage, sampling & analysis, and packaging in the test abstract. Otherwise, please explain how these design objectives are being addressed by the test abstract.

(BNL RAI 14.2-62)

14.02-75

DCD Subsection 14.2.12.1.84, Sampling System Pre-op Test, tests the capability of the "sampling system," and refers to DCD Subsection 9.3.2. However, it is not fully clear which sampling systems are within the scope of the test. DCD Subsection 9.3.2 is titled "Process and Post-Accident Sampling Systems" and includes 6 sampling sub-systems, one of which is the SG Blowdown Sampling System, that has a separate test in DCD Subsection 14.2.12.1.83. Please revise DCD Subsections 14.2.12.1.83 and/or 14.2.12.1.84, accordingly, to clarify where and how these sampling systems are being tested.

(BNL RAI 14.2-63)

14.02-76

Part A: DCD Subsection 14.2.12.1.86, "Fuel Handling System Preoperational Test," addresses the tests referred to in RG 1.68, Appendix. A, Section 1.m (4) and (5). RG 1.68, Appendix. A, Section 1.m (4) references NUREG-0554 and NUREG-0612 for these tests. DCD Subsection 14.2.12.1.86 references NUREG-0612 but does not

reference NUREG-0554. RG 1.68, Appendix. A, Section 1.m also notes that: "full operational testing should be at 100% of rated load." Please revise DCD Subsection 14.2.12.1.86 to incorporate a reference to NUREG-0554 and to address the RG 1.68 guidance that full operational testing be conducted at 100% of rated load.

Part B: RG 1.68, Appendix. A, Section 1.m (2), calls for tests of refueling equipment, including hand tools and grapples. DCD Subsection 9.1.4.2.1 discusses various fuel handling tools, such as a new and a spent fuel assembly handling tool and a rod control cluster (RCC) handling tool. Please revise DCD Subsection 14.2.12.1.86 to address the various fuel handling tools discussed in DCD Subsection 9.1.4.2.1.

(BNL RAI 14.2-64)

14.02-77

DCD Subsection 14.2.12.1.87, Component Cooling Water System Preoperational Test, provides the abstract for testing the CCW system. Two key functions of the system do not appear to be tested: (1) verification of the cooling capability of the heat exchangers; and (2) prevention of leakage of radioactive fluids into or out of the CCW system, and detection of leakage of radioactive material into the CCW system. Please revise DCD Subsection 14.2.12.1.87 to provide information on how the above two key functions of the CCW will be tested.

(BNL RAI 14.2-65)

14.02-78

RG 1.68.3 provides guidance for preoperational testing of Instrument and Control Air Systems. DCD Subsections 14.2.12.1.91 and 14.2.12.1.92 provide the test abstracts for testing of the Instrument Air System and the Station Service Air System. However, neither of these reference RG 1.68.3 for the testing. Please revise DCD Subsections 14.2.12.1.91 and 14.2.12.1.92 to include a reference to RG 1.68.3 and any relevant test pre-requisites, objectives, and/or acceptance criteria.

(BNL RAI 14.2-66, Part A)

14.02-79

RG 1.68.3 provides guidance for preoperational testing of Instrument and Control Air Systems. Table 1.9.1-1 notes conformance to this RG with some exceptions. One exception is to item C.8.b of RG 1.68.3, which specifies a gradual loss of pressure test. The table does not provide a clear justification for this exception. Please add RG 1.68.3, item C.8.b test condition to DCD Subsections 14.2.12.1.91 and 14.2.12.1.92 or provide a clear justification for not performing the gradual loss of pressure test.

(BNL RAI 14.2-66, Part B)

14.02-80

DCD Subsection 14.2.12.1.98, Class 1E Electrical Room HVAC Preoperational Test, tests the air handling units. DCD Subsection 14.2.12.1.102, Non-Class 1E Electrical Room HVAC Preoperational Test, tests the air handling units. DCD Subsection 14.2.12.1.111, Turbine Building area Ventilation System (Electric Equipment Area) Preoperational Test, tests the fans. These three systems are also required to maintain H_2 concentration of less than 2% in the battery rooms. Please revise the acceptance criateria of DCD Subsections 14.2.12.1.98, 14.2.12.1.102 and 14.2.12.1.111 to incorporate the requirement to maintain H_2 concentration of less than 2% in the battery rooms.

(BNL RAI 14.2-67)

14.02-81

DCD Subsection 14.2.12.1.100, Main Steam/Feedwater Piping Area HVAC Preoperational Test, tests the air handling units and refers to DCD Subsection 9.4.3, which in turn references Figure 9.4.3-3. This figure appears incorrect in that, although labeled as Main Steam/Feedwater HVAC, the drawing repeats the Electric Room HVAC shown in Figure 9.4.3-2. Please revise Figure 9.4.3-3 in DCD Subsection 9.4.3 to correctly depict the Main Steam/Feedwater HVAC.

(BNL RAI 14.2-68)

14.02-82

DCD Subsection 14.2.12.1.101, MCR HVAC System Preoperational Test, tests the MCR HVAC System and MCR habitability. This System is described in DCD Subsection 9.4.1. Two important functions of the system in DCD Subsection 9.4.1 do not appear in the test abstract: proper automatic switching to the emergency pressurization mode and to the emergency isolation mode. These functions should be added to the test abstract. The test abstract should also include a requirement that the system design per DCD Subsection 9.4.1 will be verified. Additionally, DCD Subsection 9.4.1 and Tables 1.9.1-1 & 14.2-2 commit to RG 1.196 which specifies, among other items, testing guidance for the MCR envelope integrity. Please include a reference to 1.196 test guidance in this test abstract.

In summary, please revise DCD Subsection 14.2.12.1.101 to: (1) address proper automatic switching to the emergency pressurization mode and to the emergency isolation mode; (2) require that the system design as specified in DCD Subsection 9.4.1 will be verified, and (3) include relevant RG 1.196 test guidance.

(BNL RAI 14.2-69)

14.02-83

DCD Section 14.2.12.1.103, Technical Support Center HVAC Preoperational Test, tests the TSC HVAC System and refers to DCD Section 9.4.3. Section 9.4.3.4.4 and Tables 1.9.1-1 and 14.2-2 include a commitment to conduct testing of the TSC HVAC System in accordance with RG 1.140. RG 1.140, Section C.6, includes guidance for testing, including "Initial In-place Testing." Please revise DCD Section 14.2.12.1.103 to include the relevant provisions of RG 1.140, Section C.6.

(BNL RAI 14.2-70)

14.02-84

DCD Subsection 14.2.12.1.105, Vessel Servicing Preoperational Test, addresses the heavy lifting equipment described in DCD Subsection 9.1.5. RG 1.68, App. A, section 1.o (1) calls for tests of the associated refueling lifting equipment (e. g., slings). DCD Subsection 9.1.5 mentions slings, hooks, etc. These should be added to Test abstract 14.2.12.1.105. RG 1.68 section 1.o (3) calls for a demonstration of the operability of safety devices. DCD Subsection 9.1.5.5 describes safety devices in addition to the interlocks. These safety devices need to be included in the test abstract.

In summary, please revise DCD Section 14.2.12.1.105 to: (1) incorporate dynamic and static load testing of the lifting equipment identified in DCD Subsection 9.1.5, and (2) require a demonstration of the operability of the safety devices identified DCD Subsection 9.1.5.5.

(BNL RAI 14.2-71)

14.02-85

DCD Subsection 14.2.12.1.107, "Pressurizer Heater and Spray Capability and Continuous Spray Flow Verification Test," appears to duplicate, to some extent, DCD Subsection 14.2.12.1.2, "Pressurizer Pressure and Water Level Control Preoperational Test." In addition, Test Method C.5 of DCD Subsection 14.2.12.1.107 is not sufficiently detailed, and the reference in Acceptance Criterion D.2 to DCD Subsection 5.4.11.1 does not appear to be correct.

Please revise DCD Subsection 14.2.12.1.107 to: (1) clarify the distinction between DCD Subsections 14.2.12.1.107 and 14.2.12.1.2; (2) add additional detail to Test Method C.5 of DCD Subsection 14.2.12.1.107, and (3) correct or clarify the reference to DCD Section 5.4.11.1 in DCD Subsection 14.2.12.1.107, Acceptance Criterion D.2.

(BNL RAI 14.2-72)