ArevaEPRDCPEm Resource

From:	Pederson Ronda M (AREVA NP INC) [Ronda.Pederson@areva.com]
Sent:	Friday, September 04, 2009 4:37 PM
To:	Tesfaye, Getachew; Miernicki, Michael
Cc:	BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); DUNCAN Leslie E (AREVA NP INC)
Subject:	Response to U.S. EPR Design Certification Application RAI No. 260, FSAR Ch. 14
Attachments:	RAI 260 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 260 Response US EPR DC.pdf," provides technically correct and complete responses to 27 of 32 questions.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 260 Questions 14.02-100, 14.02-101, 14.02-104 through 14.02-122, 14.03-11, and 14.03.03-41 through 14.03.03-44.

The following table indicates the respective pages in the response document, "RAI 260 Response US EPR DC.pdf," that contain AREVA NP's response to the subject questions.

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A complete answer is not provided for the 5 of the 32 questions. The schedule for technically correct and complete responses to these questions is provided below.

Question #	Response Date
RAI 260 — 14.02-99	October 21, 2009
RAI 260 — 14.02-102	October 21, 2009
RAI 260 — 14.02-103	October 21, 2009
RAI 260 — 14.02-111, Part c	October 21, 2009
RAI 260 — 14.03.02-42	December 18, 2009

Sincerely,

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Sent: Wednesday, August 05, 2009 2:02 PM
To: ZZ-DL-A-USEPR-DL
Cc: Tomon, John; Peralta, Juan; Wolfgang, Robert; Segala, John; Jeng, David; Chakravorty, Manas; Ng, Ching; Dixon-Herrity, Jennifer; Kleeh, Edmund; Laura, Richard; Miernicki, Michael; Colaccino, Joseph; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 260 (2569, 2714,3084, 3181, 2776, 3262), FSAR Ch. 14

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on July 14, 2009, and on August 3, 2009, you informed us that the RAI is clear and no further clarification is needed. As a result, no change is made to the draft RAI. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs. For any RAIs that cannot be answered within 30 days, it is expected that a date for receipt of this information will be provided to the staff within the 30 day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
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Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 788

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Response to

Request for Additional Information No. 260 (2569,2714,3084,3181,2776,3262), Revision 0

8/05/2009

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 14.02 - Initial Plant Test Program - Design Certification and New License Applicants
SRP Section: 14.03 - Inspections, Tests, Analyses, and Acceptance Criteria
SRP Section: 14.03.02 - Structural and Systems Engineering - Inspections, Tests, Analyses, and Acceptance Criteria
SRP Section: 14.03.03 - Piping Systems and Components - Inspections, Tests, Analyses, and Acceptance Criteria

Application Section: SRP 14.02

QUESTIONS for Quality and Vendor Branch 1 (AP1000/EPR Projects) (CQVP)
QUESTIONS for Balance of Plant Branch 1 (AP1000/EPR Projects) (SBPA)
QUESTIONS for Structural Engineering Branch 2 (ESBWR/ABWR Projects) (SEB2)
QUESTIONS for Engineering Mechanics Branch 2 (ESBWR/ABWR Projects) (EMB2)
QUESTIONS for Construction Inspection and Allegations Branch (CCIB)

Question 14.02-99:

In RAI 14.02-77 the NRC staff requested that AREVA revise Test #033 to add specific acceptance criteria by which to verify the integrity of the feedwater piping, supports, and sparger. In its response, the applicant stated that the evaluation of the acceptance criteria contains both a quantitative and a qualitative component and described the attributes of both of these components. However, the applicant also stated that it would not change the FSAR as a result of this question. For completeness and accuracy, the NRC staff requests that the applicant include its description of the qualitative and quantitative acceptance criteria to test abstract #033 in the following manner:

5.1 Perform a visual inspection consisting of both a quantitative and qualitative evaluation of feedwater piping, supports, and sparger and determine if the integrity of components has not been violated with performance of EFWS initiation testing.

5.1.1 The quantitative component of the evaluation is a post-test evaluation of the SG sparger for visual damage. The inspection will look for cracked welds and inspect the sparger by comparing as-built dimensions to post-test dimensions. Any dimensional differences will be evaluated. The specific allowable dimensional differences are not typically specified in the SG design package and are evaluated on a case-by-case basis if differences are noted.

5.1.2 The qualitative component evaluates noise and vibration. The source of noise and vibration may indicate EFW line voiding or two phase flow and can lead to future sparger degradation if not corrected.

Response to Question 14.02-99:

A response to this question will be provided by October 21, 2009.

Question 14.02-100:

In RAI 14.02-78 the NRC staff requested that AREVA revise Test #042 to give more specific information on the design specifications for the turbine building crane and include a reference to the appropriate FSAR section that provides the requisite acceptance criteria. In its response, the applicant stated that test abstract #042 was included because the turbine building (TB) crane can be used to handle TB components or containers of radioactive waste following a steam generator (SG) tube leak. Additionally the applicant stated that the TB crane is rated to handle the heaviest TB component, which is the low pressure turbine or the main generator stator. Therefore, the TB crane acceptance criteria and vendor will be selected based upon the selection of the steam turbine and main generator vendor. Finally, the applicant also stated that it would not change the FSAR as a result of this question. Consistent with the response provided, the NRC staff requests that the applicant revise acceptance criteria 5.1 (or the appropriate FSAR section) to include a provision that the TB crane be rated to handle the heaviest TB component, either the Low Pressure Turbine or the main generator stator.

Response to Question 14.02-100:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #042 will be revised to include the requested information regarding verification that the Turbine Building crane is capable of handling the heaviest turbine component.

U.S. EPR FSAR Tier 2, Section 14.2.12 will be revised to provide test abstracts for Test #090 and Test #160:

- A COL information item and test abstract will be added to Test #090 (plant laboratory equipment). The COL information item will be added to U.S. EPR FSAR Tier 2, Table 1.8-2, Item 14.2-12, and the test information will be added to U.S. EPR FSAR Tier 2, Table 14.2-1.

- A test abstract will be added to Test #160.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 1.8-2, Section 14.2.12, and Table 14.2-1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-101:

In RAI 14.02-32 the NRC staff requested that the applicant revise the acceptance criteria section of each test abstract to include explicit, measurable criteria (e.g., values, prescribed limits, or measurable parameters) from the relevant EPR FSAR section(s) that establish the functional adequacy of the SSCs and design features tested, and that provide a direct correlation to the test objective(s) being effectively met. In its response, the applicant proposed to revise Section 14.2.12.3.4, “Containment Isolation Valves (Test #027)”, to include acceptance criteria 5.2.2 referencing FSAR Table 14.3-2, Item 2-14; however, Item 2-14 does not exist in Table 14.3-2. Therefore, the staff requests that the applicant clarify its response accordingly.

Response to Question 14.02-101:

Item 2-14 was added to U.S. EPR FSAR Tier 2, Table 14.3-2 in the Response to RAI 104, Question 14.03.11-2. The references to “Table 14.3-2 Item 2.10” and “Table 14.3-2 Item 2-14” in U.S. EPR FSAR Tier 2, Section 14.2.12, Test #027, Step 5.2.1 and Step 5.2.2 are still valid.

U.S. EPR FSAR Tier 2, Section 14.2 will also be revised to make editorial corrections and test abstract clarifications:

- Test #024, Step 3.3 will be revised to delete “seal” when referring to the structural integrity test to be consistent with other structural integrity test abstracts.

- Test #024, Step 5.3 will be revised to add acceptance criteria details.

- Test #025, Step 1.1 will be revised to expand details of the test objectives.

- Test #045 will be revised to replace the acronym “SWSS” used to define “seal water supply system” because the acronym is not used in U.S. EPR FSAR Tier 2, Section 9.2.7.

- Test #045 will be revised to add Step 3.8 to verify proper operation of the seal water supply system buffer tank upon a simulated loss of offsite power (LOOP).

- Test #060, Step 2.1 will be revised to replace the acronym “FWHS” used to define “feedwater heater drain and vent system,” and Step 5.1 will be revised to incorporate an editorial change.

- Test #060, Step 3.7 will be added to demonstrate operation of the high level drain valves (valves divert shell side flow upon actual or simulated high level).

- Test #073, Step 4.1 through Step 4.5 will be revised to clarify the test data required. The system name used throughout Test #073 will be changed to “containment building ventilation system (CBVS)” or “CBVS” to be consistent with the system information in U.S. EPR FSAR Tier 2, Section 9.4.7.

- Test #074, Step 3.2 and Step 5.1 will be revised for clarification.

- Test #075, Step 3.3, Step 3.4, Step 3.9, Step 4.3, and Step 4.6 will be revised for clarification.
- Test #170, Introduction, Step 3.1, and Step 4.3 will be revised to delete “elbow trap.”
- Test #173, Step 3.1.6, will be revised to change “charging flow control valve” to “letdown flow control valve.”
- Test #176, Step 2.1 will be revised to change “BAST is filled with borated water” to “BAST is filled to a suitable level with borated water.”
- Test #178 will be revised to delete spacing errors (sentence breaks at the incorrect locations).
- Test #182, Step 3.1 will be revised to insert the word “each,” as an editorial change.
- Test #184, Step 3.2 will be revised to delete “one to” from the phrase ”at least one to three drop times for each RCCA” to clarify the test method.
- Test #188 will be revised to delete a spacing error (sentence break at the incorrect location).
- Test #201, Step 1.2 and Step 3.2 will be revised to expand test details.
- Test #206, Section 1.0 and Section 4.0 will be revised to expand test details.
- Test #217, Step 1.2 will be deleted as an editorial change.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-102:

In RAI 14.02-64 the NRC staff requested that the applicant revise Table 1.9-2 to include use of RG 1.20 during startup vibration tests or provide justification for the exception to RG 1.20. In its response, the applicant proposed to revise Table 1.9-2, Table 1.8-2, Section 3.9.2.4.1, Section 14.2.7 and Section 14.2.12 (Tests #029, #066 and #164) to include use of RG 1.20. However, in the proposed revision to FSAR Tier 2 Section 14.2.12.13.4, “Pre-Core Reactor Internals Vibration Measurements (Test #164)," the test objective is still not clear as written. Therefore, the staff requests that the applicant revise the Objective for test abstract #164 so that demonstrating that the reactor internal vibration is within design limits is clearly identified as a test objective.

Response to Question 14.02-102:

A response to this question will be provided by October 21, 2009.

Question 14.02-103:

In RAI 14.02-81 the NRC staff requested that the applicant revise Test #107 to give more specific information on the manufacturer design specifications of the Auxiliary Steam Generating System (ASGS) and to include a reference to the applicable section in the FSAR. In its response to this question the applicant stated that the information requested about the manufacturer design specifications depends on the selection of the auxiliary steam boiler vendor, which occurs later in the design process. However, based on the applicant's stated purpose of the ASGS to provide gland steam for the turbine seals and to allow a gradual power reduction during normal conditions, bounding acceptance criteria such as the system's ability to provide a certain steam pressure, temperature, and flow rate should be known prior to the selection of a vendor. Therefore, the staff requests that the applicant include under the acceptance criteria in test abstract #107 either the requisite bounding system performance criteria or the FSAR section for the Auxiliary Steam Generating System that provides the bounding system performance criteria.

Response to Question 14.02-103:

A response to this question will be provided by October 21, 2009.

Question 14.02-104:

In RAI 14.02-32 the NRC staff requested that the applicant revise the acceptance criteria section of each test abstract to include explicit, measurable criteria (e.g., values, prescribed limits, or measurable parameters) from the relevant EPR FSAR section(s) that establish the functional adequacy of the SSCs and design features tested, and that provide a direct correlation to the test objective(s) being effectively met. In its response to this question the applicant proposed to revise Section 14.2.12.9.6, “Reactor Coolant Drain Tank (Test #096)”, which incorrectly refers to FSAR Section 9.3.4, in Test Methods section 3.2 and Acceptance Criteria section 5.1 for design requirements for the RCDT. Instead, Section 14.2.12.9.6 should refer to FSAR Section 9.3.3. Additionally, the staff recommends that the applicant include test abstracts #096, “Reactor Coolant Drain Tank,” and #097, “Equipment Drain Tank,” in FSAR Section 9.3.3 for completeness and accuracy.

Response to Question 14.02-104:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #096, Step 5.1 and Test #097, Step 5.1 will be revised to reference U.S. EPR FSAR Tier 2, Section 9.3.3.2.2. U.S. EPR FSAR Tier 2, Section 9.3.3.2.2 will be revised to provide a description of the reactor coolant drain tank (RCDT). U.S. EPR FSAR Tier 2, Section 9.3.4.1 will be revised to provide additional details on the failure position of chemical and volume control system (CVCS) valves.

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #097 will also be revised to accurately reflect equipment terminology. Equipment drain tank (EDT) will be replaced with process drain tank throughout U.S. EPR FSAR Tier 2, Section 14.2.12, Test #097.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.3.3.2.2, Section 9.3.4.1, and Section 14.2.12 (Test #096 and Test #097) will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-105:

In RAI 14.02-32 the NRC staff requested that the applicant revise the acceptance criteria section of each test abstract to include explicit, measurable criteria (e.g., values, prescribed limits, or measurable parameters) from the relevant EPR FSAR section(s) that establish the functional adequacy of the SSCs and design features tested, and that provide a direct correlation to the test objective(s) being effectively met. In its response, the applicant proposed to revise Section 14.2.12.11.3, “Boron Concentration Measurement System (Test #126)”, to modify the wording of the Objectives under section 1.2 from “verify electrical independence” to “to demonstrate electrical independence.” For consistency with other proposed test abstract revisions, the NRC staff requests that the applicant make the following additional revisions to test abstract #126:

1. Revise Test Methods section 3.9 to include the following:

   “Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.”

2. Revise Acceptance Criteria section 5.3 to include the following:

   “Verify that safety-related components meet electrical independence and redundancy requirements.”

Response to Question 14.02-105:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #126 will be revised to further clarify the boron concentration measurement system (BCMS) electrical independence and redundancy requirements:

- Step 3.9 will be revised to “Check electrical independence and redundancy of the BCMS power supplies for safety-related functions by selectively removing power and determining loss of function.”

- Step 5.3 will be revised to include “Verify that BCMS safety-related components meet electrical independence and redundancy requirements.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #126 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-106:

In RAI 14.02-69, the NRC staff requested that AREVA provide more detail as to the function of the self-testing feature described in FSAR Section 14.2.12.12.7, “Radiation Monitoring (Test #143),” as well as how it ensures that the monitor meets the acceptance criteria in Chapter 7 and 12 of the U.S. EPR FSAR. The applicant included the following information in its response to question 14.02-69:

“The U.S. EPR digital radiation monitoring system (RMS) instrumentation and control includes self-testing features and diagnostics that allow early detection of failures. The tests and inspections of the RMS include checks, calibrations, and functional tests of the individual instrumentation channels which can be performed during power operation or refueling. In addition, the RMS subsystems and components incorporate features for periodic and unscheduled maintenance, repair, and inspection.

The purpose of these system inspection and maintenance capabilities is to minimize the occurrence of system faults and to increase RMS system availability. Inspection intervals depend on the local situation and the working condition of the RMS. If a subsystem or component of the RMS is unavailable or removed for maintenance, inspection or repair, the ability of the redundant divisions to perform their safety-related functions is not impaired.

Access to the internally set parameters (e.g., calibration factors, alarm thresholds, and analog output ranges) is prohibited while the instrument is in operation. However, a dedicated portable test computer allows access to the internal parameters when the RMS is removed from service, and the test procedures described above are done with the help of this test computer. While the instrument is removed from service for testing, maintenance, or repair, it is put in a test mode that makes any output signal or alarm invalid.”

The staff has determined that this information is necessary to fully describe the RMS design and functional features in the U.S. EPR. Therefore, the NRC staff requests that the applicant add the information provided in its response to question 14.02-69 to the FSAR in either sections 7.1.1.5.5 or 12.3.4, accordingly. Additionally, the staff request that the applicant revise FSAR Section 14.2.12.12.7, acceptance criteria 5.2, to include Table 11.5-1, and Table 12.3-3.

Response to Question 14.02-106:

To fully describe the RMS design and functional features, U.S. EPR FSAR Tier 2, Section 7.1.1.5.5 will be revised to include the following:

> “The U.S. EPR digital radiation monitoring system (RMS) instrumentation and control includes self-testing features and diagnostics that allow early detection of failures. The tests and inspections of the RMS include checks, calibrations, and functional tests of the individual instrumentation channels which can be performed during power operation or refueling. In addition, the RMS subsystems and components incorporate features for periodic and unscheduled maintenance, repair, and inspection.”
>
> The purpose of these system inspection and maintenance capabilities is to minimize the occurrence of system faults and to increase RMS system availability. Inspection intervals depend on the local situation and the working condition of the RMS. If a subsystem or

component of the RMS is unavailable or removed for maintenance, inspection or repair, the ability of the redundant divisions to perform their safety-related functions is not impaired.

Access to the internally set parameters (e.g., calibration factors, alarm thresholds, and analog output ranges) is prohibited while the instrument is in operation. However, a dedicated portable test computer allows access to the internal parameters when the RMS is removed from service, and the test procedures described above are done with the help of this test computer. While the instrument is removed from service for testing, maintenance, or repair, it is put in a test mode that makes any output signal or alarm invalid."

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #143, Step 5.2 will be revised to add "The airborne and area radiation monitors are listed in Table 11.5-1 and Table 12.3-3, respectively."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 7.1.1.5.5 and Section 14.2.12, Test #143 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-107:

The NRC staff requests that the applicant revise the prerequisite section of U.S. EPR FSAR Section 14.2.12.11.18, “Radiation Monitoring (Test #143),” to include the following:

a. Revise prerequisite item 2.1 to state “Construction Activities on the radiation monitoring system have been completed with all radiation monitors positioned in accordance with table 12.3-3 of the U.S. EPR FSAR.”

b. Revise prerequisite item 2.7 to state "Verify proper radiation monitoring system alarm set points, operation, control and indication functions."

Response to Question 14.02-107:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #143 will be revised as follows:

- Step 2.1 will be revised to “Construction activities on the safety-related radiation monitoring system have been completed with all radiation monitors positioned per Table 12.3-3.”

- Step 2.7 will be revised to “Verify proper operation of alarm setpoints, operation, control, and indication functions.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #143 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-108:

The NRC staff requests that the applicant make the following revisions to the US EPR FSAR section 14.2.12.9.11, Station Blackout Diesel Generator Set (Test #101):

a. Change the title of the test abstract to “Station Blackout Diesel Generator Mechanical (Test #101)” for completeness and accuracy with the title in section 14.2.12.9.12, Station Blackout Diesel Generator Electrical (Test #102).

b. Add the Station Blackout Diesel Generator crankcase ventilation system to the prerequisites (2.0) section of test abstract #101.

c. Include the SBODG electrical system to the acceptance criteria section (5.0), since prerequisite 2.2 of test abstract #101 requires the “SBODG system instrumentation has been calibrated and is functional for performance of the following test.”

Response to Question 14.02-108:

U.S. EPR FSAR Tier 2, 14.2.12, Test #101 will be revised as requested including items a, b, and c in the question. The associated name of Test #101 in U.S. EPR FSAR Tier 2, Table 14.2-1 will also be revised. Only a portion of the station blackout diesel generator (SBODG) electrical and instrumentation testing will be performed in U.S. EPR FSAR Tier 2, Section 14.2.12, Test #101. The remaining electrical and instrumentation components will be tested in U.S. EPR FSAR Tier 2, Section 14.2.12, Test #102.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12 and Table 14.2-1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-109:

In Section 14.2.12.9.12, "Station Blackout Diesel Generator Electrical (Test #102)," the acceptance criteria item 5.1 states "The SBODG electrical system meets the design requirements of FSAR section 8.4." The NRC staff requests that the applicant revise acceptance criteria item 51 to state the following; "The SBODG electrical and I&C systems meet design and reliability requirements (refer to sections 7.4.1, 8.4, and 8.4.1.4)."

Response to Question 14.02-109:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #102, Step 5.1 will be revised to reference U.S. EPR FSAR Tier 2, Sections 7.4.1, 8.4, and 8.4.1.4 as recommended.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #102 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-110:

The NRC staff requests that the applicant make the following revisions to the US EPR FSAR section 14.2.12.9.14, Emergency Diesel Generator Set (Test #104):

a. Change the title of the test abstract to “Emergency Diesel Generator Mechanical (Test #104)” for completeness and accuracy with the title in section 14.2.12.9.15, "Emergency Diesel Generator Electrical (Test #105).

b. Include the demonstration of the alternate feed connection capability between divisions (used when one EDG is inoperable or in maintenance) as one of the objectives or justify its exclusion.

c. Add the EDG crankcase ventilation system to the prerequisites section of test abstract #104.

d. Revise item 3.5 of test abstract #104 to include "without any failures."

e. Include sections 8.4.1 and 7.3.1.2.12 of the FSAR to the acceptance criteria section, since portions of the electrical and I&C systems are being tested through this test abstract.

Response to Question 14.02-110:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #104 and Test #105 will be revised as follows:

a. The title of Test #104 will be changed from “Emergency Diesel Generator Set” to “Emergency Diesel Generator Mechanical.” The associated title of Test #104 in U.S. EPR FSAR Tier 2, Table 14.2-1 will also be revised.

b. Test #105, Step 3.6.3 will be added for the connecting and automatic loading of alternate loads.

c. Test #104, Step 2.1.7 will be added to include “Crankcase ventilation system (refer to Section 9.5.8).”

d. Test #104, Step 3.5 will be revised to include “without failures.”

e. Test #104, Step 5.1 will be revised to include references to Sections 7.3.1.2.12, 8.3.1, and 8.4.1.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12 and Table 14.2-1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-111:

The NRC staff requests that the applicant make the following revisions to the US EPR FSAR section 14.2.12.9.15, Emergency Diesel Generator Electrical (Test #105):

a. Add to test method item 3.1, which requires a "demonstration of the control logic and controls including the EDG sequencer and response to ESF actuation signals" to also include a “demonstration of the EDG load carrying capability with the alternate feed connected between divisions (when one EDG is inoperable).

b. Include an item in the prerequisite section that requires the “emergency diesel generator demonstration should be performed one at a time”.

c. Change item 3.9.3 of test abstract #105 to change the “90% to 100%” to “95% to 100%”.

d. Add section 7.3.1.2.12 of the FSAR to the acceptance criteria section, since the test abstract verifies EDG alarms, interlocks and control functions.

Response to Question 14.02-111:

U.S. EPR FSAR Tier 2, Section 14.2, Test #105 will be revised as follows:

a. Step 3.1.1 and Step 3.1.2 will be added.

b. Step 2.10 will be added. (Note - The suggested wording seemed to be more of a scheduling constraint than a technical constraint. It is unlikely that testing personnel could support multiple emergency diesel generator (EDG) tests in parallel, but the prerequisite wording was revised to provide a technical basis.)

c. A response to this question will be provided by October 21, 2009.

d. Step 5.1 will be revised to reference Section 7.3.1.2.12.

FSAR Impact:

a. U.S. EPR FSAR Tier 2, Section 14.2.12, Test #105 will be revised as described in the response and indicated on the enclosed markup.

b. U.S. EPR FSAR Tier 2, Section 14.2.12, Test #105 will be revised as described in the response and indicated on the enclosed markup.

c. A response to this question will be provided by October 21, 2009.

d. U.S. EPR FSAR Tier 2, Section 14.2.12, Test #105 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-112:

The NRC staff requests that the applicant revise test method item 3.3 in Section 14.2.12.10.1, "Switchyard and Preferred Power (Test #108)," to state the following; "Verify operation and redundancy of the switchyard 125 Vdc auxiliary supply system and its associated controls, alarms and batteries."

Response to Question 14.02-112:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #108, Step 3.3 will be revised to indicate that the system has dual battery supplies. The U.S. EPR FSAR uses the 'redundancy' term for safety-related applications. This non-safety-related system has dual battery supplies that send individual signals to the breaker, but batteries are not totally redundant.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #108 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-113:

In Section 14.2.12.10.2, “Main Generator (Test #109),” test method item 3.4 verifies the operation of the generator circuit **breaker [**emphasis added], which implies a single circuit breaker operation. Since the operation of two circuit breakers are required to isolate plant power output, the staff requests that the applicant revise the test abstract accordingly. Additionally, this test abstract should address a single failure of the circuit breakers (i.e., stuck breaker cases) to verify that the backup protection scheme works.

Response to Question 14.02-113:

U.S. EPR FSAR Tier 2, Section 14.2, Test #109 will be revised as follows:

- Step 3.4 will be revised to verify “each of the generator circuit breakers, in the plant switchyard.”

- Step 3.5.1 will be added to “Verify that the backup protection scheme works for simulated single failures by verifying operation of the primary and backup relay systems.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #109 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-114:

The US EPR FSAR item 8.3.2.4.1 Battery Acceptance Testing (page 8.3-52) states that battery acceptance testing is conducted in accordance with Reference 39 (i.e., IEEE Std. 450-2002, “IEEE Recommended Practice for Maintenance, Testing and Replacement of Vented Lead-Acid batteries for Stationary Applications”) as supplemented by RG 1.129, “Maintenance, Testing, and Replacement of Vented Lead-Acid Storage Batteries for Nuclear Power Plants.” Although the staff endorsed the aforementioned IEEE standard in the RG 1.129, the staff took a few exceptions in regulatory positions. The NRC staff requests that the applicant revise item 3.1a of section 14.2.12.10.3, "Class 1E Uninterruptible Power Supply (Test #110)", and section 14.2.12.10.4, "Non-Class 1E Uninterruptible Power Supply (Test #111)", to reflect RG 1.129 as the acceptance criteria rather than IEEE standard 450-2002.

Response to Question 14.02-114:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #110 and Test #111 will be revised to per IEEE 450-2002 as endorsed by RG 1.129 with exceptions.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-115:

The NRC staff requests that the applicant clarify the following aspects to the US EPR FSAR section 14.2.12.10.9, 6.9 kV Emergency Power Supply System (Test #116):

a. The objectives section of test abstract #116 describes testing the power supply from either normal or alternate source, but not the automatic bus transfer scheme. Clarify whether this test involves an automatic bus transfer scheme from normal to alternate power supplies.

b. Clarify whether test abstract #116 includes the alternate feed connection capability between divisions (i.e., used when one EDG is out on maintenance).

c. The U.S. EPR FSAR states that EDG has no load sequencers (i.e., timing relays), since this will be performed by controlling the placement of loads onto the respective EPSS at programmed time intervals by the protection system (PS). Clarify what is being tested in item 3.8, of section 14.2.12.10.9, "6.9 kV Emergency Power Supply System (Test #116)", for the US EPR EDG load sequencing.

d. Clarify what type of under-voltage (loss of voltage or degraded voltage) is being tested in items 3.5 and 4.3 of test abstract #116.

Response to Question 14.02-115:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #116 will be revised as follows:

a. Objectives will be revised to include normal supply, alternate supply, and automatic transfer feature.

b. Step 3.6 will be revised and Step 3.7 and Step 3.8 will be added to require testing while connected to the normal supply and the alternate supply, and verify that the automatic transfer occurs from the normal supply to the alternate supply.

c. Step 3.8 (which was renumbered to Step 3.10 in Part b of this response) will be revised to verify that the protection computer sequences loads on the emergency bus. It is technically correct that the U.S. EPR does not have a load sequencer device and this function is performed by the protection system in response to engineered safety feature (ESF) type actuation signals. Step 3.10 is not specific whether this sequencing is to be performed while aligned to the normal offsite supply, alternate offsite supply, normal EDG supply, or the alternate EDG supply, however, Test #105 verifies that the normal EDG and the alternate EDG supplies are sequenced by the protection system. These should be the bounding load sequencing events.

d. Step 3.5 and 4.3 will be revised to demonstrate the designed response to an under voltage condition described in U.S. EPR FSAR Tier 2, Section 8.3.1.1.3. Step 3.4.1 will be revised from 10 percent nominal voltage to 5 percent nominal voltage.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #116 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-116:

The NRC staff requests that the applicant revise the US EPR FSAR section 14.2.12.10.11, 13.8 kV Normal Power Supply System (Test #118) to include an additional objective that corresponds with acceptance criteria 5.2 relative to safety-related components meeting electrical independence and redundancy requirements. In addition, the staff requests that the applicant clarify how (i.e., test method) the automatic bus transfer scheme between normal and alternate power supplies is being tested under this test abstract.

Response to Question 14.02-116:

Electrical independence and redundancy requirements are only applicable to reactor coolant pump (RCP) breakers where the safety-related function is to disconnect the RCP from the normal power supply. U.S. EPR FSAR Tier 2, Section 14.2.12, Test #118 will be revised to verify electrical independence and redundancy of RCP breaker protective devices.

The U.S. EPR 13.8 kV normal power supply system includes design features to provide automatic transfer from the normal offsite supply to an alternate offsite power supply at the 13.8 kV level. U.S. EPR FSAR Tier 2, Section 14.2.12, Test #118 will be revised to test this feature.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #118 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-117:

The NRC staff requests that the applicant revise the test methods of US EPR FSAR section 14.2.12.10.12, "6.9 kV Normal Power Supply System (Test #119), to include the following:

a. Revise test method item 3.1 to state the following: "Demonstrate the operation and functionality of the 480 Vac source and feeder circuit breaker (isolation devices) to locally and remotely isolate class 1E and non-class 1E systems."

b. Re-insert test method item 3.6, which was removed by the applicant in response to RAI 144.

Response to Question 14.02-117:

a. The 6.9kV normal power supply system does not supply class 1E systems so there are no circuit breakers that perform this function. The class 1E loads are described in U.S. EPR FSAR Tier 2, Section 14.2, Test #116. The test abstract in U.S. EPR FSAR Tier 2, Section 14.2, Test #119, Step 3.1 will be revised to “Demonstrate the operation and functionality of the 480 Vac source and feeder circuit breaker (isolation devices) to locally and remotely isolate non-class 1E systems."

b. Realignment of power from the normal offsite supply source to the alternate offsite source occurs on the 13.8kV level and is not duplicated on the 6.9kV level. The original text in U.S. EPR FSAR Tier 2, Section 14.2, Test #119, Step 3.6 was in error. U.S. EPR FSAR Tier 2, Section 14.2, Test #119, Step 3.6 was correctly deleted in the Response to RAI 144, Supplement 1, Question 14.02-72.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #119 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-118:

The emergency lighting system provides lighting for operation of safety-related equipment for implementing plant safe shutdown, firefighting, and access routes to the main control room (MCR) and remote shutdown station (RSS). US EPR FSAR section 14.2.12.10.8, Emergency Lighting System (Test #115), Test Method 3.6 needs to be revised to include verification of RSS emergency lighting.

Response to Question 14.02-118:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #115, Step 3.7 will be added to include verification of remote shutdown station emergency lighting and Step 3.3 will be clarified.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #115 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-119:

The NRC staff requests that the applicant revise the title of US EPR FSAR section 14.2.12.10.16, 12-Hour Accident Uninterruptible Power Supply (Test #123), to “12-Hour Uninterruptible Power Supply (Test #123). Additionally, the staff requests that the applicant revise test abstract #123 to include meggering and visual inspection checks of buses and equipment to the prerequisite section.

Response to Question 14.02-119:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #123 will be revised as follows:

- Title changed to “12-Hour Uninterruptible Power Supply,” as requested.
- Step 2.9 added to include “Megger and perform visual inspection of buses and associated components.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #123 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-120:

The NRC staff requests that the applicant revise the test methods section of US EPR FSAR Section 14.2.12.10.16, “12-Hour Accident Uninterruptible Power Supply (Test #123),” to include the following:

a. Revise test method item 3.8 to include the DC/DC converter.

b. Add the following to the test methods section:

   "Demonstrate that the batteries and battery charger meet design capacities by performing discharge and charging tests as follows:

   1) Perform battery modified performance discharge or service test in accordance with RG 1.129.

   2) Perform battery charger capacity test to verify battery charger output meets design criteria."

Response to Question 14.02-120:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #123 will be revised as follows:

a. Step 3.8 revised to functionally test the DC/DC converter.

b. Step 3.9 added to incorporate the requested information into the test abstract.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Test #123 will be revised as described in the response and indicated on the enclosed markup.

Question 14.02-121:

In RAI question 14.02-88 the NRC staff requested that the applicant revise the applicable test abstracts to include, where appropriate, the types of performance demonstrations, measurements, and tests listed in RG 1.68, Appendix A.5. In the response to this question the applicant stated that the Power Ascension Test listed in RG 1.68 Appendix A.5.t, which verifies as appropriate, the operability, response times, relieving capacities, set points, and reset pressures for pressurizer relief valves; main streamline relief valves; atmospheric steam dump valves; turbine bypass valves; and turbine stop, intercept, and control valves was not applicable to US EPR. The staff notes that test abstracts #37, #60, #61 and #63 address performance of these tests and demonstration of operability for the above listed valves during hot functional testing. Therefore, the NRC staff requests that the applicant revise table 14.2-1 of the US EPR FSAR to include RG 1.68 Appendix A.5.t for test abstracts #37, #60, #61 and #63 or justify its exclusion.

Response to Question 14.02-121:

The applicability of RG 1.68, Appendix A.5.t to the test abstracts in U.S. EPR FSAR Tier 2, Section 14.2 is shown in Table 14.02-121-1.

U.S. EPR FSAR Tier 2, Section 14.2 will be revised as follows:

- Test #061, Steps 3.3 and 4.4 will be revised and Step 4.6 will be added to clarify that valve opening setpoint and response time is to be recorded.

- Test #068, Step 2.5 will be revised to replace “secondary side of the SG” with “steam turbine.”

- Test #068, Step 3.2.2 will be revised to add details clarifying the valve response time is to be recorded.

- Test #068, Step 3.5 will be revised to change the reference to Section 10.2.

- Test #151 will be revised by adding Step 3.1.1 and Step 3.1.2 clarifying that the valve response time and reset pressure is to be recorded.

- Table 14.2-1 will be revised to indicate that RG 1.68, Appendix A.5.t is applicable for Test #037, Test #061, Test #062, Test #068, Test #148, and Test #151.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12 and Table 14.2-1 will be revised as described in the response and indicated on the enclosed markup.

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
Sheet 1 of 8

Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
1	Pressurizer Relief Valve (spring loaded valve)	Operability	037	Technical Specification 3.4.10 describes the conditions for determining operability. Technical Specification operability will be determined when Technical Specifications are implemented in the time between fuel load and prior to MODE 3.
2	Pressurizer Relief Valve (spring loaded valve)	Response time	037	The response time of the valve will be verified by the valve vendor prior to shipment and by insitu testing.
3	Pressurizer Relief Valve (spring loaded valve)	Relieving capacity	037	The relieving capacity will be verified by the valve vendor and supplied by certified test report. It is not feasible to measure the two-phase mass flow from the valve discharge insitu, but the valve will be opened during hot functional testing to verify the ability of the downstream piping and supports to withstand the full discharge.
4	Pressurizer Relief Valve (spring loaded valve)	Setpoint	037	The valve setpoint will be verified by the valve vendor and insitu using system pressure in combination with a special test device.
5	Pressurizer Relief Valve (spring loaded valve)	Reset pressure	037	The reset pressure is a function of the internal design of the relief valve and the adjustment of the blowdown ring. This testing will be supplied by the valve vendor by certified test report.
6	Pressurizer Relief Valve (power operated valve)	Operability	151	The power operated pressurizer relief valves (PORV) are not required for Technical Specification operability.

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
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Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
7	Pressurizer Relief Valve (power operated valve)	Response time	151	This is a power operated valve and the response time is governed by component design and dynamic tuning. The response time will be optimized to provide rapid, but controllable response.
8	Pressurizer Relief Valve (power operated valve)	Relieving capacity	151	The relieving capacity will be verified by the valve vendor and supplied by certified test report. It is not feasible to measure the two-phase mass flow from the valve discharge, but the valve will be opened during hot functional testing to verify the ability of the downstream piping and supports to withstand the full discharge.
9	Pressurizer Relief Valve (power operated valve)	Setpoint	151	The setpoint for this valve is a computer database value. The valve operation will be verified by using simulated transmitter inputs and verifying the valve responds. System pressure is required to provide motive force.
10	Pressurizer Relief Valve (power operated valve)	Reset pressure	151	The setpoint for this valve is a computer database value. The valve operation will be verified by using simulated transmitter inputs and verifying the valve responds. System pressure is required to provide motive force.

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
Sheet 3 of 8

Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
11	Main Steamline Relief Valves (spring loaded valves)	Operability	062	Technical Specification 3.7.1 describes the conditions for determining operability. Technical Specification operability will be determined when Technical Specifications are implemented in the time between fuel load and prior to MODE 3.
12	Main Steamline Relief Valves (spring loaded valves)	Response time	062	The response time for this valve will be determined by the valve vendor and documented in a certified test report. If this valve is stroked full open with only the heat input during hot function testing (HFT), the resulting cooldown would exceed analyzed limits and potentially cause permanent damage to reactor coolant system (RCS) components.
13	Main Steamline Relief Valves (spring loaded valves)	Relieving capacity	062	The relieving capacity for this valve will be determined by the valve vendor and documented in a certified test report. If this valve is stroked full open with only the heat input during HFT, the resulting cooldown would exceed analyzed limits and potentially cause permanent damage to RCS components.
14	Main Steamline Relief Valves (spring loaded valves)	Setpoint	062	The valve setpoint will be verified by the valve vendor and insitu using system pressure in combination with a special test device.

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
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Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
15	Main Steamline Relief Valves (spring loaded valves)	Reset pressure	062	The reset pressure is a function of the internal design of the relief valve and the adjustment of the blowdown ring. This testing will be supplied by the valve vendor by certified test report.
16	Main Steamline Relief Valves (power operated - main steam relief train) “MSRT” could also be called Atmospheric Steam Dump Valves	Operability	148	Technical Specification 3.7.4 describes the conditions for determining operability. Technical Specification operability will be determined when Technical Specifications are implemented between fuel load and prior to MODE 3.
17	Main Steamline Relief Valves (power operated - main steam relief train) “MSRT” could also be called Atmospheric Steam Dump Valves	Response time	148	This is a power operated valve and the response time is governed by component design and dynamic tuning. The response time will be optimized to provide rapid but controllable response. The dynamic response of these valves will be demonstrated during Test #152 (Note: this valve will only be partially open due to limited heat input during HFT).

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
Sheet 5 of 8

Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
18	Main Steamline Relief Valves (power operated - main steam relief train) “MSRT” could also be called Atmospheric Steam Dump Valves	Relieving capacity	148	The relieving capacity for this valve will be determined by the valve vendor and documented in a certified test report. If this valve is stroked full open with only the heat input during HFT, the resulting cooldown would exceed analyzed limits and potentially cause permanent damage to RCS components.
19	Main Steamline Relief Valves (power operated - main steam relief train) “MSRT” could also be called Atmospheric Steam Dump Valves	Setpoint	148	The setpoint for this valve is a computer database value. The valve operation will be verified by using simulated transmitter inputs and verifying the valve responds. Actual system pressure is not required.
20	Main Steamline Relief Valves (power operated - main steam relief train) “MSRT” could also be called Atmospheric Steam Dump Valves	Reset pressure	148	The setpoint for this valve is a computer database value. The valve operation will be verified by using simulated transmitter inputs and verifying the valve responds. Actual system pressure is not required.

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
Sheet 6 of 8

Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
21	Turbine Bypass Valves	Operability	061	These non-safety-related valves are not required for Technical Specification operability.
22	Turbine Bypass Valves	Response time	061	This is a power operated valve and the response time is governed by component design and dynamic tuning. The response time will be optimized to provide rapid, but controllable response. The dynamic response of these valves will be demonstrated during Test #061 (Note: this valve will only be partially open due to limited heat input during HFT).
23	Turbine Bypass Valves	Relieving capacity	061	The relieving capacity for this valve will be determined by the valve vendor and documented in a certified test report. If this valve is stroked full open with only the heat input during HFT, the resulting cooldown would exceed analyzed limits and potentially cause permanent damage to RCS components.
24	Turbine Bypass Valves	Setpoint	061	The setpoint for this valve is a computer database value. The valve operation will be verified by using simulated transmitter inputs and verifying the valve responds. Actual system pressure is not required.
25	Turbine Bypass Valves	Reset pressure	061	The setpoint for this value is a computer database value. The valve operation will be verified by using simulated transmitter inputs and verifying the valve responds. Actual system pressure is not required.

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
Sheet 7 of 8

Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
26	Turbine Stop	Operability	068	These non-safety-related valves are not required for Technical Specification operability.
27	Turbine Stop	Response time	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The response time is tracked by the turbine control computer.
28	Turbine Stop	Relieving capacity	068	This valve does not function as a relief valve, so this function is not applicable.
29	Turbine Stop	Setpoint	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The setpoint for these valves is a turbine trip.
30	Turbine Stop	Reset pressure	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The parameter “reset pressure” is not applicable for these valves.
31	Turbine Intercept	Operability	068	These non-safety-related valves are not required for Technical Specification operability.
32	Turbine Intercept	Response time	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The response time is tracked by the turbine control computer.
33	Turbine Intercept	Relieving capacity	068	This valve does not function as a relief valve, so this function is not applicable.

Table 14.02-121-1—NRC Regulatory Guide 1.68 Appendix A.5.t
Sheet 8 of 8

Item	Component	Test Description	Related Test # in U.S. EPR FSAR Tier 2, Section 14.2.12	Comments
34	Turbine Intercept	Setpoint	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The setpoint for these valves is a turbine trip.
35	Turbine Intercept	Reset pressure	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The parameter “reset pressure” is not applicable for these valves.
36	Turbine Control	Operability	068	These non-safety-related valves are not required for Technical Specification operability.
37	Turbine Control	Response time	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The response time is tracked by the turbine control computer.
38	Turbine Control	Relieving capacity	068	This valve does not function as a relief valve, so this function is not applicable.
39	Turbine Control	Setpoint	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The setpoint for these valves is a turbine trip.
40	Turbine Control	Reset pressure	068	These valves are power operated (electro-hydraulic) and are controlled by the turbine controls. The parameter “reset pressure” is not applicable for these valves.

Question 14.02-122:

Regulatory Guide 1.68, Appendix A.1.n.(18), “Auxiliary and Miscellaneous Systems,” states that “the applicant should conduct tests to demonstrate the operability of heat tracing and freeze protection system." The NRC staff requests that the applicant review the test abstracts in section 14.2-12 of the U.S. EPR FSAR to include provisions for electrical heat tracing and freeze protection systems. Additionally, the staff requests that the applicant include the applicable general requirements for electrical heat tracing in the applicable section(s) of the U.S. EPR FSAR.

Response to Question 14.02-122:

The following changes will be incorporated into U.S. EPR FSAR, Tier 2:

a. U.S. EPR Tier 2, Section 14.2, Test #114 and Table 14.2-1 will be revised to add a heat tracing test.

    - In general, the U.S. EPR uses enriched boric acid so that boron concentrations are relatively low compared to the current generation of nuclear plants. With low boron concentrations, the U.S. EPR temperature maintenance requirements are typically accomplished by maintaining area temperatures above an established minimum temperature.

    - Radiation monitoring sensing lines and other systems that require heat tracing will be preoperational tested using U.S. EPR Tier 2, Section 14.2, Test #114.

b. U.S. EPR Tier 2, Section 8.3 will be revised to state the following:

    - “Electrical heat-tracing systems are installed as necessary to provide electrical heating where needed to maintain temperatures above ambient for either freeze protection or system operation. Power for heat-tracing is supplied from the onsite distribution system buses. Where safety-related process and effluent radiological monitoring and sampling systems require heat-trace to perform its function, the heat-tracing is powered from Class 1E distribution system buses and assigned to the appropriate EPSS or EUPS division.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 14.2.12, Table 14.2-1, and Section 8.3 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03-11:

Table 14.3-8, "ITAAC Screening Summary," lists Kraftwerks Kennzeichen System (KKS) codes for the Emergency Diesel Generator Set. These System KKS codes do not agree with the system KKS codes that are listed in the Equipment Tag Number column in Table 2.5.4-1, "Emergency Diesel Generator Equipment Mechanical Design," and Table 2.5.4-2, "Emergency Diesel Generator Electrical Equipment Design." Table 2.5.4-1 lists system KKS code JXN (Fuel Oil Storage Tank), which does not appear in Table 14.3-8 for the Emergency Diesel Generator Set. Table 14.3-8 lists system KKS codes XKA and CXN for the Emergency Diesel Generator Set, but these codes do not appear in Table 2.5.4-1 or Table 2.5.4-1.

The FSAR should be changed to correct this inconsistency.

Response to Question 14.03-11:

U.S. EPR FSAR Tier 1, Table 2.5.4-1 will be revised to indicate the fuel oil storage tanks as 30XJN10BB001, 30XJN20BB001, 30XJN30BB001, and 30XJN40BB001. This change provides consistency between U.S. EPR FSAR Tier 1, Table 2.5.4-1 and U.S. EPR FSAR Tier 2, Table 14.3-8.

Emergency diesel generators (EDG) are identified by KKS codes XKA in U.S. EPR FSAR Tier 1, Table 2.5.4-3. U.S. EPR FSAR Tier 1, Table 2.5.4-3 will be revised to include the main control room and remote shutdown station display and control information for Division 2 EDG.

KKS code CXN listed in U.S. EPR FSAR Tier 2, Table 14.3-8 is related to the instrumentation and control functions of the EDG. The EDG I&C functionality is verified in U.S. EPR FSAR Tier 1, Section 2.4.1, protection system. U.S. EPR FSAR Tier 2, Table 14.3-8 will be revised to delete KKS code CXN.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.5.4-1 and Table 2.5.4-3 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 2, Table 14.3-8 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.02-42:

In its response to **RAI 132, Question 14.03.02-11-1, part h,** the applicant stated that the U.S. EPR FSAR Tier 1, Section 2.1 would be revised to provide additional details regarding the basis for protection against pressurization effects associated with postulated rupture of pipes. In the revised design description write-up of Section 2.1.1 and associated subsections there are references to accident pressure loads and pipe break loads, however there is nothing that specifically addresses cubicle pressurization loads and the basis for protection against pressurization effects. Also in revised ITAAC Tables 2.1.1-4 and 2.1.1-8, cubicle pressurization effects have not been explicitly included. Table 2.1.1-4 provides ITAAC for the Nuclear Island which includes the Reactor Building. Item 3.4 in Table 2.1.1-4 states under "Commitment Wording", that a pipe break hazards analyses summary exists that concludes the plant can be safely shut down and maintained in a cold safe shutdown following a pipe break with loss of offsite power. Under "Inspection, Analysis or Test" it states that a pipe break hazards analysis will be performed. Under "Acceptance Criteria", it addresses pipe stresses in the penetration area, pipe whip restraints and jet impingement shields, environmental effects of postulated pipe rupture, and loads on safety-related SSCs. Cubicle pressurization is not mentioned. Under "Commitment Wording", it should state what the pipe break hazards analysis includes and address cubicle pressurization. Under "Inspection, Analysis or Test" a second activity should be added requiring that an inspection of as-installed features that provide protection against pipe break effects including the effects of cubicle pressurization will be performed and compared to the requirements identified in the pipe break hazards analysis. Under "Acceptance Criteria" cubicle pressurization should be addressed. Item 3.5 in Table 2.1.1-4 appears to address jet impingement shields and pipe whip restraints for certain rooms listed in Table 2.1.1-6. As a result it is not clear if Item 3.4 addresses all other jet impingement shields and pipe whip restraints or is not supposed to address them at all. The applicant needs to revise the wording in the "Commitment Wording", "Inspection, Analysis or Test" and "Acceptance Criteria" columns for items 3.4 and 3.5 so it is clear as to which aspect of pipe hazards analysis each of these ITAAC items is to address.

Table 2.1.1-8 addresses ITAAC for the Reactor Building. Item 2.4 under Commitment Wording, states that the RB structures are Seismic Category I structures designed and constructed to withstand design basis loads as specified below. Among the loads specified below are accident pressure loads and pipe break loads including reaction loads, jet impingement loads and missile impact loads. The first activity under "Inspection, Analysis or Test" states that an analysis of the RB structures will be performed to the design basis loads. It is not clear if the analysis described in Item 2.4 for pipe break loads will be the same analysis described in Item 3.4 of Table 2.1.1-4 or is a different analysis. The scope that is assigned to Items 3.4 and 3.5 in Table 2.1.1-4 and that assigned to Item 2.4 in Table 2.1.1-8 as it relates to the effects of pipe break needs to be clear and precise. Because it is not, the applicant is requested to do the following as it relates to pipe break, pipe break effects and cubicle pressurization:

1. Include in the design description for the NI structures the basis for protection against cubicle pressurization effects.
2. For Item 3.4 of Table 2.1.1-4, under "Commitment Wording" specify what pipe break effects the pipe break hazards analysis includes and include cubicle pressurization if it applies to this item. Also specify which NI structures this item is applicable to and whether or not it includes the reactor building.

3. For Item 3.4 of Table 2.1.1-4 under "Inspection, Analysis or Test", include an inspection of the structure and require a reconciliation of the inspection with the structural requirements of the pipe break hazards analysis.
4. For Item 3.4 of Table 2.1.1-4 under "Acceptance Criteria", include the acceptance criteria for cubicle pressurization.
5. As both Item 3.4 and Item 3.5 of Table 2.1.1-4 address design features to protect against the effects of pipe break and because Item 3.5 could be a subset of Item 3.4, provide a distinction between the "Commitment Wording", "Inspection Analysis or Test", and "Acceptance Criteria" for each of these items so that there is no ambiguity as to what each are intended to address.
6. Regarding Item 2.4 of Table 2.1.1-8 the applicant is requested to revise this item such that there is no confusion between the scope of Item 2.4 as it relates to pipe break loads and pipe break effects (including cubicle pressurization) and the scope that Items 3.4 and 3.5 of Table 2.1.1-4 are intended to cover.

Response to Question 14.03.02-42:

A response to this question will be provided by December 18, 2009.

Question 14.03.03-39:

In EPR FSAR Tier 2, Section 3.10.4, AREVA indicated that the COL applicant referencing the US EPR design certification will create and maintain the SQDP file during the equipment selection and procurement phase. Specifically, in Tier 2, Table 1.8-2, Item No. 3.10-2, the applicant states that a COL applicants (Holders in this case) referencing the US EPR design certificate will address the final resolution of the issue. However, the staff concern is that COL applicants must address all COL Items whether final action will be taken before or after the license is issued. To allow the staff to perform necessary review or confirming the creation of the SQDP during the equipment selection and procurement phases, the staff finds that an ITAAC in the FSAR is necessary. The staff requests the applicant to add an appropriate ITAAC in EPR FSAR Tier 1 to address the issue.

Response to Question 14.03.03-39:

Inspections, tests, analyses, and acceptance criteria (ITAAC) already exist in U.S. EPR FSAR Tier 1 for the seismic qualification of components and the associated seismic qualification data packages (SQDP). The seismic qualification ITAAC listed in Table 14.03.03-39-1 were clarified and standardized in the Response to RAI 210, Supplement 1, Question 14.03.02-12:

- Design commitments were revised to: "Components identified as Seismic Category I in Table x.x.x-x can withstand seismic design basis loads without a loss of the function listed in Table x.x.x-x."
- ITAAC were revised as shown in Table 14.03.03-39-2.

As described in the ITAAC acceptance criteria, "Seismic qualification reports (SQDP, EQDP, or analyses) exist and conclude that the Seismic Category I components identified in Table x.x.x-x can withstand seismic design basis loads without a loss of the function listed in Table x.x.x-x." Therefore, since ITAAC must be closed out prior to fuel loading, seismic qualification reports will be available for NRC review during plant construction.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Table 14.03.03-39-1—Design Commitments and ITAAC for Seismic Category I Components

U.S. EPR FSAR Tier 1, Section #	Design Commitment and ITAAC #
2.2.1	3.3
2.2.2	3.3
2.2.3	3.4
2.2.4	3.4
2.2.5	3.4
2.2.6	3.4
2.2.7	3.4
2.2.8	3.2
2.3.3	3.4
2.4.22	3.1
2.5.4	3.7
2.6.1	3.3
2.6.3	3.3
2.6.4	3.3
2.6.6	3.3
2.6.7	3.3
2.6.8	3.4
2.6.9	3.3
2.6.13	3.3
2.7.1	3.4
2.7.2	3.4
2.7.5	3.2
2.7.11	3.4
2.8.2	3.3
2.8.6	3.4
2.8.7	3.3
2.9.4	3.1
3.5	3.4
3.7	3.2

Table 14.03.03-39-2—Standard ITAAC Format for Seismic Category I Components

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
ITAAC # x.x	Components identified as Seismic Category I in Table x.x.x-x can withstand seismic design basis loads without a loss of the function listed in Table x.x.x-x.	a. Type tests, analyses, or a combination of type tests and analyses will be performed on the components identified as Seismic Category I in Table x.x.x-x using analytical assumptions, or under conditions, which bound the Seismic Category I design requirements.	a. Seismic qualification reports (SQDP, EQDP, or analyses) exist and conclude that the Seismic Category I components identified in Table x.x.x-x can withstand seismic design basis loads without a loss of the function listed in Table x.x.x-x.
		b. Inspections will be performed of the as-installed Seismic Category I components identified in Table x.x.x-x to verify that the components, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).	b. Inspection reports exist and conclude that the as-installed Seismic Category I components identified in Table x.x.x-x, including anchorage, are installed as specified on the construction drawings and deviations have been reconciled to the seismic qualification reports (SQDP, EQDP, or analyses).

Question 14.03.03-40:

ITAAC Item 7.1 in Table 2.2.3-3

The applicant in its written response to question 14.03.03-16 revised the AC to state the heat load per one heat exchanger is 2.35E+08 BTU/hr. The written response stated that this heat load was during a design basis accident condition when one heat exchanger was not available do to preventive maintenance, and another heat exchanger was not available do to a single failure. The AC as revised states the SIS/RHRS has the capacity to remove the design heat load via the heat exchangers listed in Table 2.2.3-1. If the heat load is during a design basis accident condition, how many heat exchangers are assumed as being able to remove that heat load in the AC as revised?

Response to Question 14.03.03-40:

U.S. EPR FSAR Tier 1, Table 2.2.3-3, Item 7.1 was revised in the Response to RAI 128, Supplement 1, Question 14.03.03-16 and in the Response to RAI 182, Supplement 2, Question 14.03-10, Part J (Item #10). In the revised ITAAC in U.S. EPR FSAR Tier 1, Table 2.2.3-3, Item 7.1, two low head safety injection (LHSI) heat exchangers are assumed available, with each LHSI heat exchanger capable of removing the heat load listed in the ITAAC acceptance criteria.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 14.03.03-41:

ITAAC Item 2.1 in Table 2.4.7-1

The applicant in its response to Question 14.03.05-19 revised the ITA to include an analysis in addition to an inspection. In the AC as revised, how does the inspection verify the location of the SMS equipment? Preferably there should be two ITAAC: First ITAAC would be to determine the location of the SMS equipment by an analysis, and the second ITAAC would be to verify by inspection that the location of the SMS equipment was in accordance with the analysis.

Response to Question 14.03.03-41:

U.S. EPR FSAR Tier 1, Table 2.4.7-1, Item 2.1 will be revised to split the inspections, tests, analyses (ITA) and the acceptance criteria (AC) into two parts as recommended in the question. Part a of the ITAAC will be analyses to determine the location of the seismic monitoring system (SMS) equipment, and Part b of the ITAAC will be an inspection to verify the location of the seismic monitoring system (SMS) equipment is per the analyses.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.4.7-1 will be revised as described in the response and indicated on the enclosed markup.

Question 14.03.03-42:

ITAAC Items 5.11, 5.12, and 5.15 in Table 2.5.1-3

The applicant in its responses to Questions 14.03.06-14 and 15 revised the respective ITA to include an analysis in response to RAI 116, Question 14.03.06-3 but deleted the inspection previously in the ITA. In each AC as revised, the respective electrical equipment are sized or rated to perform their intended functions solely by an analysis. Preferably there should be two ITAAC: First ITAAC would be to determine size or rating of the respective equipment by an analysis, and the second ITAAC would be to verify by inspection that the correct electrical equipment was instaled in accordance with the analysis. This inspection is not to verify the location or arrangment of the eletrical equipment, but to verify that the correct electrical equipment per the analysis is installed in the field.

Response to Question 14.03.03-42:

The U.S. EPR FSAR will be revised to include an inspection in the applicable system inspections, tests, analyses column of the identified ITAAC tables. Performance of the inspection verifies that the equipment has been installed in the field in the configuration for which the equipment was analyzed. Inspections for ITAAC Items in addition to U.S. EPR FSAR Tier 1, Table 2.5.1-3, Items 5.11, 5.12, and 5.15 will also be revised to include this configuration ITAAC inspection due to the similarity of the equipment being verified.

The following ITAAC items will be revised to include an inspection in the inspections, tests, analyses column to verify that the equipment is installed in the field in the analyzed configuration:

- Table 2.5.1-3, Item 5.11.
- Table 2.5.1-3, Item 5.12.
- Table 2.5.1-3, Item 5.13.
- Table 2.5.1-3, Item 5.14.
- Table 2.5.1-3, Item 5.15.
- Table 2.5.2-3, Item 5.10.
- Table 2.5.2-3, Item 5.11.
- Table 2.5.2-3, Item 5.14.
- Table 2.5.2-3, Item 5.16.
- Table 2.5.2-3, Item 5.17.
- Table 2.5.2-3, Item 5.18.

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 2.5.1-3 and Table 2.5.2-3 will be revised as described in the response and indicated on the attached markup.

Question 14.03.03-43:

ITAAC Item 5.3 in Table 2.5.4-3

The applicant changed this ITAAC in response to Question 14.03.06-23 to determine the output rating of each EDG by an analysis. The applicant also changed the AC of this ITAAC to verify that the EDG provides the minimum required voltage at the safety related equipments supplied by the EDG with voltage and frequency within a specified range of variance. The present Commitment Wording only addresses the design commitment that the EDG output rating be above the total demand of the loads connected and capable of being connected to it. The present Commitment Wording does not address the design commitment of each EDG providing a minimum required operating voltage at the supplied safety-related equipment with the EDG steady-state output voltage at ± 5 percent and steady state frequency at ± 2 percent of nominal. The staff wants to know how the present Commitment Wording and ITA address the additional step in the AC about each EDG providing a minimum required voltage to its connected loads?

Response to Question 14.03.03-43:

U.S. EPR FSAR Tier 1, Section 2.5.4 will be revised to add Item 6.7 which indicates, "Each EDG is capable of starting from standby conditions and achieving required voltage and frequency." U.S. EPR FSAR Tier 1, Table 2.5.4-4 commitment wording will be revised to add, "6.7 Each EDG is capable of starting from standby conditions and achieving required voltage and frequency." U.S. EPR FSAR Tier 1, Table 2.5.4-4, Item 6.7, inspections, tests, analyses column will be revised to add "A test will be performed." U.S. EPR FSAR Tier 1, Table 2.5.4-4, Item 6.7, acceptance criteria column will be revised to add "Each EDG starts from standby conditions and achieves voltage ≥ 6555 V and frequency ≥ 58.8 Hz in ≤ 15 seconds; and steady state voltage ≥ 6555 V and ≤ 7260 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz." U.S. EPR FSAR Tier 1, Table 2.5.4-4, Item 5.3, acceptance criteria part b. will be deleted.

The changes provided in U.S. EPR FSAR Tier 1, Section 2.5.4 provide the commitment and verification of the EDG to provide minimum required voltage to its connected loads at the required frequency.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.5.4 and Table 2.5.4-4 will be revised as described in the response and indicated on the attached markup.

Question 14.03.03-44:

ITAAC Item 2.3 in Table 2.6.9-3

The applicant in its response to Question 14.03.07-16 changed the AC to indicate that each mechanical division of the Emergency Power Generating Building Ventilation System (EPGBVS) is as shown on Figures 2.6.9-1 through 2.6.9-4, and that two mechanical divisions are located in each of the two EPGBs. The staff initially agreed with the applicant's response and closed this RAI question. However, the figures show that there are four EPGBs. That means there is one mechanical division of EPGBVS per EPGB. The question is how are there two mechanical divisions of the EPGBVS in each of two EPGBs?

Response to Question 14.03.03-44:

There are two separate Emergency Power Generating Buildings (EPGB) designated as 1/2EPGB and 3/4EPGB, as shown in U.S. EPR FSAR Tier 1, Figure 2.1.2-1. EPGBVS, Division 1, and Division 2 are located in 1/2EPGB, and EPGBVS Division 3, and Division 4 are located in 3/4EPGB. Each EPGBVS division has its own independent heating, ventilation, and air conditioning system as shown in U.S. EPR FSAR Tier 1, Figures 2.6.9-1 through 2.6.9-4.

U.S. EPR FSAR Tier 1, Section 2.6.9.1.0, Table 2.6.9-1, and Table 2.6.9-2 will be revised to clarify equipment and component locations in 1/2EPGB and 3/4EPGB.

U.S. EPR FSAR Tier 1, Table 1.3-1 will be revised to add the acronym "1/2 EPGB".

FSAR Impact:

U.S. EPR FSAR Tier 1, Table 1.3-1, Section 2.6.9.1.0, Table 2.6.9-1, and Table 2.6.9-2 will be revised as described in the response and indicated on the enclosed markup.

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Table 1.8-2—U.S. EPR Combined License Information Items
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Item No.	Description	Section	Action Required by COL Applicant	Action Required by COL Holder
14.2-12	A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for plant laboratory equipment.	14.2.12	Y	
14.3-1	A COL applicant that references the U.S. EPR design certification will provide ITAAC for emergency planning, physical security, and site-specific portions of the facility that are not included in the Tier 1 ITAAC associated with the certified design (10 CFR 52.80(a)).	14.3	Y	
14.3-2	A COL applicant that references the U.S. EPR design certification will describe the selection methodology for site-specific SSC to be included in ITAAC, if the selection methodology is different from the methodology described within the FSAR, and will also provide the selection methodology associated with emergency planning and physical security hardware.	14.3	Y	
14.3-3	A COL applicant that references the U.S. EPR design certification will identify a plan for implementing design ITAAC. The plan will identify 1) the evaluations that will be performed for design ITAAC, 2) the schedule for performing these evaluations, and 3) the associated design processes and information that will be available to the NRC for audit.	14.3		Y
16.0-1	Reviewer's Notes and brackets are used to identify information or parameters that are plant specific or are based on preliminary design information. A COL applicant that references the U.S. EPR design certification will provide the necessary information in response to the Reviewer's Notes and replace preliminary information provided in brackets of the Technical Specifications and Technical Specification Bases with plant specific values.	16.0	Y	

- Effluent radioactivity monitoring.
- Airborne radioactivity monitoring.
- Area radioactivity monitoring.

14.02-106

The U.S. EPR digital radiation monitoring system (RMS) instrumentation and control includes self-testing features and diagnostics that allow early detection of failures. The tests and inspections of the RMS include checks, calibrations, and functional tests of the individual instrumentation channels which can be performed during power operation or refueling. In addition, the RMS subsystems and components incorporate features for periodic and unscheduled maintenance, repair, and inspection.

The purpose of these system inspection and maintenance capabilities is to minimize the occurrence of system faults and to increase RMS availability. Inspection intervals depend on the local situation and the working condition of the RMS. If a subsystem or component of the RMS is unavailable or removed for maintenance, inspection or repair, the ability of the redundant divisions to perform their safety-related functions is not impaired.

Access to the internally set parameters (e.g., calibration factors, alarm thresholds, and analog output ranges) is prohibited while the instrument is in operation. However, a dedicated portable test computer allows access to the internal parameters when the RMS is removed from service, and the test procedures described above are done with the help of this test computer. While the instrument is removed from service for testing, maintenance, or repair, it is put in a test mode that makes any output signal or alarm invalid.

The RMS consists of various detectors and processing equipment throughout the plant. Refer to Section 7.3.1 for radiation monitors used in ESF actuation functions. For radiation monitors used for PAM, refer to Section 7.5.1. For other monitoring functions, refer to Chapter 11 and Chapter 12.

7.1.1.5.6 Hydrogen Monitoring System

Classification

The hydrogen monitoring system (HMS) is classified as safety-related.

Description

The HMS is described in Section 6.2.5.

Electrical grounds for the ground bus of all switchgear assemblies, MCCs and load centers are bonded to the station ground grid in at least two places.

Each building is equipped with its own grounding system, which is connected to the station ground grid. Individual building steel support columns and re-bar mesh are bonded to the station ground grid.

The main generator, EDG and SBODG neutrals are high resistance grounded using a distribution transformer method. The station auxiliary transformers high voltage winding neutral point is directly grounded to the station ground grid. The neutral for the low voltage windings are grounded using a neutral grounding resistor.

The MV transformer secondary winding neutrals are connected to the ground system through a resistance. This grounding method provides proper detection and isolation of phase-to-ground faults.

Low voltage distribution transformer secondary windings are solidly grounded.

The isolated phase bus (IPB) is electrically continuous with three phase enclosures bonded together at the generator end and at the transformer end. The IPB is grounded at a single point at the MSU end, which limits circulating currents. The bus enclosures are electrically insulated from the support structures and adjoining equipment. IPB supports located inside the turbine building are connected to the building ground grid. Outdoor supports are grounded by connecting the base of each support to the ground grid with two grounding conductors bonded to the ground grid in two locations.

Plant instrumentation is grounded through a separate radial grounding system consisting of isolated instrumentation ground buses and insulated cables. The instrumentation grounding systems are connected to the station grounding grid at one point only and are insulated from all other grounding circuits. I&C systems are grounded in accordance with Reference 17.

The DC system is operated as an ungrounded system. Ground detection is described in Section 8.3.2.3.7.

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Electrical heat-tracing systems are installed as necessary to provide electrical heating where needed to maintain temperatures above ambient for either freeze protection or system operation. Power for heat-tracing is supplied from the onsite distribution system buses. Where safety-related process and effluent radiological monitoring and sampling systems require heat-trace to perform its function, the heat-tracing is powered from Class 1E distribution system buses and assigned to the appropriate EPSS or EUPS division.

- For certain beyond design basis events (DBE), store highly contaminated liquid samples collected in the Nuclear Auxiliary Building (NAB) within the Reactor Building (RB) to delay their treatment.
- Detect and identify (to a practical extent) the location of the source of reactor coolant leakage within the RB.

9.3.3.2 System Description

9.3.3.2.1 General Description

The NIDVS is connected to a variety of systems by means of temporary and permanent connections. Permanent connections to systems of high design pressures are protected by means of flow restrictors and safety valves to maintain the pressure below the allowable design pressure of the drain system. Piping is principally arranged for gravitational flow from the drain collectors to the drain tanks. Wherever gravity drainage is impractical, mobile (portable) pumps are used. Mobile pumps are connected to the permanent piping using temporary flexible hoses. The general arrangement of the NIDVS is provided in Figure 9.3.3-1—Nuclear Island Drain and Vent System.

Effluents are classified in different groups according to their processing requirements and by whether or not they are recycled. They are collected according to their state (liquid or gaseous) and origin (primary drains, process drains, floor drains and decontamination effluents). Leakage to reactor containment from identified sources is collected so that flow rates are monitored separately from unidentified leakage and the total flow rate of each type is established and monitored. Leakage to reactor containment from unidentified sources is collected and the flow rate monitored with an accuracy of one gallon per minute or better. NIDVS pumps, tanks and sumps are sized to process the maximum expected rate of influx and total volume of expected leakage.

Refer to Section 12.3.6.5.5 for nuclear island drain/vent system design features which demonstrate compliance with the requirements of 10 CFR 20.1406.

9.3.3.2.2 Component Description

Table 3.2.2-1 provides the quality group and seismic design classification of components and equipment in the NIDVS. Components are designed to the codes and standards applicable to their equipment class. The NIDVS is divided into five subsystems:

Drains/Vents and Safety Valve Discharges Subsystem

This subsystem collects from primary (i.e., potentially radioactive) drains and vents, safety valve discharges and other effluents containing boron-10 to be recycled. It is further divided into six portions:

- Primary effluents inside RB.
- RCS sweeping and pulling.
- Primary effluents inside Safeguard Buildings (SB).
- Primary effluents inside Fuel Building (FB).
- Primary effluents inside NAB.
- Safety valve discharge of primary effluents.

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The reactor coolant drain tank (RCDT) collects effluents originating from systems containing primary coolant. The RCDT is located on the lowest floor and is continuously purged of gases by the gaseous waste processing system (GWPS). The effluents are routed to the coolant supply and storage system. The primary function is to collect RCP seal No. 213 leak-off.

The primary effluents that can not be collected by the RCDT for geometrical reasons are collected in the process drain tank. The tank is located below the RCDT and is continuously purged by the containment ventilation system. The effluents are routed to the coolant supply and storage system.

Vent and Collection of Rinse Water Subsystem

This subsystem serves as a vent system and a system that collects rinse water. In general, it is connected to the system to be vented or rinsed with flexible hoses and screwed plugs. It is further divided into three portions:

- Vent and rinse collection inside SBs.
- Vent and rinse collection inside FB.
- Vent and rinse collection inside NAB.

Type 1 Floor Drains Subsystem

This subsystem includes Type 1 floor drains, which are located in the controlled area and contain low boron-10 concentrations. It is further divided into five portions:

- RB floor drains.

9.3.4 Chemical and Volume Control System (Including Boron Recovery System)

The chemical and volume control system (CVCS) interfaces between the high pressure (HP) reactor coolant system (RCS) and low pressure (LP) systems in the Nuclear Auxiliary Building (NAB) and Fuel Building (FB). The CVCS is divided into the following three major sections:

- Letdown.
- Charging.
- Reactor coolant pump (RCP) seal water.

9.3.4.1 Design Bases

The CVCS performs the following safety-related functions:

- Maintain integrity of reactor coolant pressure boundary (RCPB) in the event of a CVCS letdown line break downstream of the RCS through closure of redundant motor-operated isolation valves. Redundant check valves in the charging line and pressurizer auxiliary spray line provide RCPB integrity.
- Mitigate boron dilution event by automatically isolating the charging pump suction from the volume control tank (VCT) and normal letdown path.
- Provide automatic isolation of charging and auxiliary spray line to prevent pressurizer over-fill in the event of a CVCS malfunction.
- Provide containment isolation by automatic closure of charging and letdown lines and RCP seal water injection and return lines.

The CVCS has the following design basis requirements and criteria:

- Safety-related portions of the CVCS are designed, fabricated, erected and tested to quality standards commensurate with the importance of the safety functions to be performed (GDC 1).
- Safety-related portions of the CVCS are designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami and seiches without loss of capability to perform their safety functions (GDC 2).
- Safety-related portions of the CVCS are not shared among nuclear power units (GDC 5).
- Safety-related portions of the CVCS are designed to maintain RCPB material integrity by means of the CVCS being capable of maintaining RCS water chemistry necessary to meet pressurized water reactor (PWR) RCS water chemistry specifications (GDC 14).

- Safety-related portions of the CVCS are designed to reliably provide negative reactivity to the reactor by supplying borated water to the RCS in the event of anticipated operational occurrences (AOO); if the plant design relies on the CVCS to perform the safety function of boration for mitigation of design basis events (DBE) (GDC 29).

- Safety-related portions of the CVCS are designed to supply reactor coolant makeup in the event of small breaks or leaks in the RCPB and to function as part of the emergency core cooling system (ECCS) assuming a single active failure coincident with a loss of offsite power (LOOP); if the plant design relies on the CVCS to perform the safety function of safety injection as part of the ECCS (GDC 33 and GDC 35). CVCS valves are designed to fail to a position (i.e., closed, open, or as-is) upon loss of motive power that meets safety analysis assumptions.

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- Safety-related portions of the CVCS are designed to have provisions for venting and draining through closed systems (GDC 60 and GDC 61).

- Safety-related portions of the CVCS are designed to have provisions for a leakage detection and control program to minimize the leakage from those portions of the CVCS outside of the containment that contain or may contain radioactive material following an accident (10 CFR 50.34(f)(2)(xxvi)).

- Safety-related portions of the CVCS are designed to provide sufficient capacity and capability to make sure that the core is cooled in the event of a station blackout (SBO) (10 CFR 50.63(a)(2)).

The CVCS is designed to meet the following functional criteria:

- Maintain and adjust the RCS boron concentration to control reactor power level variations resulting from expected reactivity changes due to the effects of xenon build-in or burn-out, and compensate for core burn-up to provide assurance that operating fuel limits are not exceeded.

- Maintain RCS water inventory by maintaining a constant charging flow and adjusting the letdown flow to account for volume changes due to RCS temperature variations.

- Provide cooled, purified and filtered water to the RCP seal water system to maintain cooling and leak tightness of the RCP seals and return seal leakage back to the CVCS.

- Provide cooled reactor coolant for chemical and radiological control of the primary coolant in combination with the coolant purification, treatment, degasification and storage systems.

- Add chemicals to the RCS to control the pH of the reactor coolant during all modes of operation; also add hydrogen to the RCS to counteract the production of oxygen in the reactor coolant due to the radiolysis of water in the reactor core region.

3.2 Measure the acceptability of the cooling system, as described in design documents.

4.0 DATA REQUIRED

4.1 Punch list of deficiencies at time of acceptance walkdown have been corrected.

4.2 Cooling system flow rate.

5.0 ACCEPTANCE CRITERIA

5.1 All deficiencies noted during the walkdown have been corrected.

5.2 The configuration, including the cooling system flow rate, is as designed (refer to Section 19.0).

14.2.12.3 Engineered Components

14.2.12.3.1 Containment Equipment Hatch Functional and Leak Test (Test #024)

1.0 OBJECTIVE

1.1 To verify the measured leakage through the containment equipment hatch when summed with the total of other Type B and C leak rate tests (LRT) is within the limits as required by the Technical Specifications and 10 CFR 50, Appendix J.

1.2 To demonstrate the operation of the containment equipment hatch.

2.0 PREREQUISITES

2.1 Construction activities on the equipment have been completed.

2.2 Temporary pressurization equipment is installed and instrumentation calibrated.

3.0 TEST METHOD

3.1 Demonstrate the operation of the equipment hatch from its normal closed location to its open location and back to its normally closed location.

3.2 Place the hatch in the closed position and perform a 10 CFR 50, Appendix J, Type B LRT.

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3.3 Place the hatch in the closed position and perform a ~~seal~~ structural integrity test at 110 percent of design basis accident pressure.

4.0 DATA REQUIRED

4.1 Containment equipment hatch leak data.

5.0 ACCEPTANCE CRITERIA

5.1 Verify leak rate, when summed with the total of other Type B and C LRTs, does not exceed the limits as required by the Technical Specifications and 10 CFR 50, Appendix J.

5.2 The equipment hatch assembly operates in accordance with manufacturer instructions.

5.3 The equipment hatch meets design requirements (refer to Sections 3.1.5, 3.8.1, and 3.8.2).

5.3.1 Structural integrity test.

5.3.2 Appendix J LRT.

5.3.3 Verify alarms, interlocks, and system controls.

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14.2.12.3.2 Containment Personnel Airlock Functional and Leak Test (Test #025)

1.0 OBJECTIVE

1.1 To verify the measured leakage, through each containment personnel airlock, when summed with the total of other Type B and Type C LRTs is within the limits as required by the Technical Specifications and 10 CFR 50, Appendix J.

1.2 To verify each, containment personnel airlock, operates as designed in Sections 3.1.5, 3.8.1, and 3.8.2.

2.0 PREREQUISITES

2.1 Construction activities on the containment personnel airlocks have been completed.

2.2 Temporary pressurization equipment is installed and instrumentation is calibrated.

2.3 Electrical checks are complete on the hatches.

3.0 TEST METHOD

3.1 Operate each airlock in accordance with manufacturer instructions; verify alarms, interlocks and indications.

3.2 Place each airlock in the closed portion and perform a 10 CFR 50, Appendix J, and Type B LRT.

3.3 Place each airlock in the closed portion and perform a structural integrity test at 110 percent of design basis accident pressure.

4.0 DATA REQUIRED

4.1 Individual airlock leak data.

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5.1.6 The turbine building crane is capable of handling the heaviest turbine building component (e.g., low pressure turbine, main generator stator)

14.2.12.5 Distributed Utilities

14.2.12.5.1 Raw Water Supply System (Test #043)

A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the raw water supply system. The following is a typical COLA test; if a site-specific test will be used, the COL applicant will provide the test.

1.0 OBJECTIVE

1.1 To demonstrate the ability of raw water supply system (RWSS) to supply filtered water to downstream systems (e.g., potable water, demineralized water system).

2.0 PREREQUISITES

2.1 Construction activities on the RWSS have been completed.

2.2 RWSS instrumentation has been calibrated and is functional for performance of the following test.

2.3 Support system required for operation of the RWSS is complete and functional.

2.4 Test instrumentation available and calibrated.

2.5 The RWSS intake is being maintained at the water level specified in the design documents.

2.6 The RWSS flow balance has been performed.

3.0 TEST METHOD

3.1 Verify that the RWSS pump and system flow meet design requirement (refer to Section 9.2.9).

3.2 Verify standby RWSS pump starts on low discharge pressure or a trip of the running pump.

4.0 DATA REQUIRED

4.1 Pump operating data.

4.2 Setpoints at which alarms and interlocks occur.

5.0 ACCEPTANCE CRITERIA

5.1 The RWSS operates as designed (refer to Section 9.2.9):

5.1.1 RWSS flow meets design requirements.

5.1.2 RWSS alarms, interlocks, and controls (manual and automatic) function as designed.

5.1.3 The RWSS pumps meet design requirements.

14.2.12.5.2 Reserved (Test #044)

14.2.12.5.3 Seal Water Supply System (Test #045)

1.0 OBJECTIVE

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1.1 To demonstrate the ability of seal water supply system (SWSS) to supply filtered seal water under normal plant operations.

1.2 To verify that the SWSSseal water supply system provides adequate sealing water to systems containing radioactive fluids.

1.3 To verify that the SWSSseal water supply system provides adequate sealing water to the gaseous waste processing and operational chilled water system.

2.0 PREREQUISITES

2.1 Construction activities on the SWSSseal water supply system have been completed.

2.2 The SWSSseal water supply system instrumentation has been calibrated and is functional for performance of the following test.

2.3 Support system required for operation of the SWSSseal water supply system is complete and functional.

2.4 Test instrumentation available and calibrated.

2.5 The SWSSseal water supply system suction supply is being maintained at the water level (pressure) specified in the design documents.

2.6 The SWSSseal water supply system flow balance has been performed.

3.0 TEST METHOD

3.1 Verify SWSSseal water supply system pump and system flow meet design specifications.

3.2 Verify standby SWSSseal water supply system pump starts on low discharge pressure or a trip of the running pump.

3.3 Verify that the SWSSseal water supply system provides designed rated flow to systems that are supplied by the seal water header.

3.4 Operate control valves remotely while:

a. Observing each valve operation and position indication.

b. Measuring valve performance data (e.g., thrust, opening and closing times).

3.5 Observe response of power-operated valves upon loss of motive power (refer to Section 9.2.7 for anticipated response).

3.6 Verify that operation of protective devices, controls, interlocks, instrumentation, and alarms meets design requirements.

3.7 Verify that the ~~SWSS~~seal water supply system can meet the following minimum and maximum design requirements:

a. The ~~SWSS~~seal water supply system pressure.

b. The ~~SWSS~~seal water supply system temperature.

3.8 Verify proper operation of the seal water supply system buffer tank upon a simulated loss of offsite power (LOOP).

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4.0 DATA REQUIRED

4.1 Pump operating data.

4.2 Setpoints at which alarms and interlocks occur.

4.3 Valve performance data, where required.

4.4 Valve position indication.

4.5 Position response of valves to loss of motive power.

5.0 ACCEPTANCE CRITERIA

5.1 The ~~SWSS~~seal water supply system meets design requirements (refer to Section 9.2.7):

5.1.1 ~~SWSS~~seal water supply system pump and system flow meet design specifications.

5.1.2 Standby ~~SWSS~~seal water supply system pump starts on low discharge pressure or a trip of the running pump.

5.1.3 ~~SWSS~~seal water supply system provides designed rated flow to systems that are supplied by the seal water header.

5.1.4 System valves perform within design limits.

14.2.12.5.4 Potable and Sanitary Water Systems (Test #225)

1.0 OBJECTIVE

1.1 To demonstrate the ability of potable water system to supply potable water under normal plant operations.

1.2 To demonstrate the ability of sanitary water system to supply sanitary water under normal plant operations.

2.0 PREREQUISITES

2.1 Construction activities on the potable and sanitary water systems have been completed.

5.2.1 Verify that isolation valves meet design requirements (e.g., response to signals, stroke speed).

5.3 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.7.2 Feedwater Heating System (Test #060)

1.0 OBJECTIVE

1.1 To demonstrate that the feedwater heating system (FWHS) is capable of heating the FWS to the design temperature for normal plant operation. This test can only be performed during HFT or similar plant conditions.

1.2 To demonstrate the FWHS alarms and controls operate as designed.

1.3 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

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2.1 Construction activities on the ~~FWHS~~feedwater heater drain and vent system have been completed.

2.2 Construction activities on the feedwater heater drains system have been completed.

2.3 FWHS instrumentation has been calibrated and is functional for performance of the following test.

2.4 Feedwater heater drains system instrumentation has been calibrated and is functional for performance of the following test.

2.5 Individual feedwater and main steam component testing is complete.

2.6 The power conversions systems are operating as required to support the test.

3.0 TEST METHOD

3.1 Verify the setpoints of alarms and interlock.

3.2 Operate control valves remotely while:

a. Observing each valve operation and position indication.

b. Measuring valve performance data (e.g., thrust, opening and closing times).

3.3 Observe response of power-operated valves upon loss of motive power (refer to Section 10.4.7 for anticipated response).

3.4 Record the feedwater temperature to the SGs at maximum attainable feedwater flow and compare the readings to those predicted by the secondary model for similar conditions.

3.5 Demonstrate that the high pressure feedwater heating system level controls maintain level as designed and drain to the deaerator.

3.6 Demonstrate that the low pressure feedwater heaters level controls maintain level as designed and drain to the main condenser.

3.7 Demonstrate operation of the high level drain valves (valves divert shell side flow upon actual or simulated high level.

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4.0 DATA REQUIRED

4.1 Valve performance data, where required.

4.2 Valve position indication.

4.3 Position response of valves to loss of motive power.

4.4 Setpoints at which alarms and interlocks occur.

4.5 Feedwater temperature and feedwater flow rate for each heater group.

4.6 Level controllers trend data.

5.0 ACCEPTANCE CRITERIA

5.1 The FWHS meets design requirements (refer to Section 10.4.7):

5.1.1 Verify that alarms and interlocks function as designed.

5.1.2 Verify that system control ~~and~~ bypass and isolation valves meet design requirements.

5.1.3 Verify that feed water temperatures at the feedwater exit meet design requirements.

14.2.12.7.3 Main Steam – Turbine Bypass Systems (Test #061)

1.0 OBJECTIVE

1.1 To demonstrate the operation of the main steam system (MSS).

1.2 To demonstrate the operation of the turbine bypass system (TBS).

1.3 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the MSS have been completed.

2.2 Construction activities on the TBS have been completed.

2.3 MSS and TBS instrumentation has been calibrated and is functional for performance of the following test.

2.4 Support systems required for operation of the MSS and TBS are complete and functional.

2.5 Test equipment is available and test instrumentation is calibrated.

3.0 TEST METHOD

3.1 Demonstrate automatic drain valve operation.

3.2 Demonstrate flow paths.

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3.3 Verify opening of the turbine bypass valves in response to a signal simulating turbine trip and simulated steam pressure above setpoint. Record response time and steam pressure setpoints when valve travel occurs.

3.4 Verify the functionality of the main steam relief train (MSRT) valves at HZP steam pressure during HFT.

3.5 Verify the functionality of the turbine bypass valves at no-load steam pressure during HFT.

3.6 Operate control valves remotely while:

a. Observing each valve operation and position indication.

b. Measuring valve performance data (e.g., thrust, opening and closing times).

3.7 Observe response of the turbine bypass valves upon loss of motive power (refer to Section 10.4.4 for anticipated response).

3.8 Verify that operation of designated components such as protective devices, controls, interlocks, instrumentation, and alarms using actual or simulated inputs function as designed.

3.9 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

4.0 DATA REQUIRED

4.1 Valve performance data, where required.

4.2 Valve position indication.

4.3 Position response of valves to loss of motive power.

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4.4 Setpoints at which valve openings, alarms, and interlocks occur.

4.5 Flow path data.

4.6 Turbine bypass valve response time (fully shut to fully open).

5.0 ACCEPTANCE CRITERIA

5.1 The MSS performance as designed (refer to Section 10.4.4).

5.2 Turbine bypass valves open in response to a signal simulating turbine trip and controls steam pressure, as designed (refer to Section 10.4.4).

5.3 Turbine bypass valves fail upon loss of motive power as designed (refer to Section 10.4.4).

3.7.2 ~~EFAS~~The blowdown system meets design requirements in response to signals described in Section 10.4.8.2.2.

3.7.3 The blowdown system meets design requirements in response to a main steam isolation signal caused by low SG pressure or high SG pressure drop.

3.7.4 The blowdown system meets design requirements in response to a partial cooldown signal coupled with either high secondary activity or high SG level.

3.7.5 The blowdown system meets design requirements in response to a safety injection signal plus loss of offsite power.

3.8 Verify SG wet layup system operations.

3.9 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

4.0 DATA REQUIRED

4.1 Valve performance data, where required.

4.2 Valve position indication.

4.3 Position response of valves to loss of motive power.

4.4 Setpoints at which alarms and interlocks occur.

4.5 Response of CIVs to ~~MSIS, CIAS~~CIS and ~~EFAS~~signals described in Section 10.4.8.2.2.

4.6 SG blowdown flow path flow rates.

5.0 ACCEPTANCE CRITERIA

5.1 The SGBS operates as designed (refer to Section 10.4.8):

5.1.1 SGBS alarms, interlocks, protective devices, and controls (manual and automatic) respond as required.

5.1.2 SGBS ~~flow~~ instrumentation performs as designed.

5.1.3 SGBS valves perform as designed (i.e., thrust, opening times, closing times, ability to initiate and terminate SGBS flow without introducing water hammers).

5.1.4 SGBS responds as designed to isolation signals.

5.1.5 SGBS flow rates meet design requirements.

5.2 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.7.10 Steam Turbine (Test #068)

1.0 OBJECTIVE

1.1 To demonstrate functional performance of the steam turbine controls.

1.2 To demonstrate functional performance of the steam turbine support system.

1.3 To perform initial operation of the steam turbine system (HFT and ~~PAT~~power ascension tests).

1.4 To verify the steam turbine generator trips in response to the following:

1.4.1 Simulated reactor trip signal.

1.4.2 Simulated loss of condenser vacuum signal.

2.0 PREREQUISITES

2.1 Construction activities on the steam turbine system are complete.

2.2 Steam turbine system instrumentation has been calibrated and is functional for the performance of the following test.

2.3 Appropriate test equipment is available and has been calibrated.

2.4 Fluid levels throughout the system meet design limits. Personnel safety shall limit proximity to lubricating and hydraulic oils.

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2.5 Schedule visual inspection of the ~~secondary side of the SG~~steam turbine following testing.

2.6 Appropriate AC and DC power sources are available and functional.

2.7 Support systems required for the steam turbine system are complete and functional.

2.8 MSS is available.

2.9 Main condenser is available.

3.0 TEST METHODS

3.1 Demonstrate the electro hydraulic control (EHC) system performs the following:

3.1.1 That turbine turning gear engages and disengages as designed.

3.1.2 That automatic control of turbine speed and acceleration functions through the entire speed range.

3.1.3 That automatic control of load and loading rate from auxiliary to full load, with continuous load adjustment and discrete loading rates.

3.1.4 Standby manual control of speed and load is functional when it becomes necessary to take the primary automatic control out of service.

3.1.5 Limiting of load in response to preset limits on operating parameters.

3.2 Verify that detection of dangerous or undesirable operating conditions, annunciation of detected conditions, and initiation of control response to such conditions meets design requirements, as follows:

3.2.1 Monitoring the status of the control systems including the power supplies and redundant control circuits.

3.2.2 Testing of valves and controls including response to a simulated reactor trip signal and simulated loss of condenser vacuum signal.

- Verify response time from initiation of a turbine trip signal to closure of the turbine stop valve.
- Verify response time from initiation of a turbine trip signal to closure of the turbine intercept valve.
- Verify response time from initiation of a turbine trip signal to closure of the turbine control valve.

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3.2.3 Pre-warming of valve chest and turbine rotor.

3.3 Perform steam turbine performance test per latest edition of ASME PTC-6 (Reference 3).

3.4 Operate control valves remotely while:

a. Observing each valve operation and position indication.

b. Measuring valve performance data (e.g., thrust, opening and closing times).

3.5 Observe response of power-operated valves upon loss of motive power (refer to Section 10.2 ~~10.3~~ for anticipated response).

3.6 Demonstrate turbine lube oil system operation.

3.7 Demonstrate hydrogen oil-sealed cooling system for rotor cooling operation.

3.8 Demonstrate stator water cooling system operation.

3.9 Demonstrate moisture separators, reheaters, and extraction steam systems operation.

4.0 DATA REQUIRED

4.1 Setpoint at which alarms and interlocks occur.

4.2 Setpoints of automatic trips.

4.3 Conditions under which manual trips operate.

4.4 Verification of control logic combinations.

4.5 Valve logic verification of EHC system.

4.6 Valve performance data, where required.

4.7 Valve position indication.

4.8 Position response of valves to loss of motive power.

4.9 Operating data and function verification of associated turbine support systems.

b. Measuring valve performance data (e.g., thrust, opening and closing times).

3.5 Verify power-operated valves fail upon loss of motive power as designed (refer to Section 10.4.8).

4.0 DATA REQUIRED

4.1 Setpoints at which alarms and interlocks occur.

4.2 Valve performance data, where required.

4.3 Valve position indication.

4.4 Position response of valves to loss of motive power.

5.0 ACCEPTANCE CRITERIA

5.1 The SGB~~DMS~~ demineralizing system meets design requirements (refer to Section 10.4.8):

5.1.1 ~~SGBDMS~~SGB demineralizing system alarms, interlocks, and controls (manual and automatic) function as designed.

5.1.2 ~~SGBDMS~~SGB demineralizing system valves perform as designed (i.e., opening times, closing times~~, and ability to control feedwater heater levels~~).

14.2.12.8 Heating Ventilation and Air Conditioning (HVAC) Systems

14.2.12.8.1 Containment Building Cooling (Test #073)

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1.0 OBJECTIVE

1.1 To demonstrate the capability of the containment ~~cooling and~~building ventilation system (CBVS) to maintain acceptable temperature limits and air quality in the containment during normal operations and normal shutdown.

2.0 PREREQUISITES

2.1 Major construction activities inside the containment building have been completed.

2.2 Construction activities on the ~~containment cooling and ventilation system~~CBVS have been completed.

2.3 ~~Containment cooling and ventilation system~~CBVS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.4 Support systems required for operation of the ~~containment cooling and ventilation systems~~CBVS are complete and functional.

2.5 Test instrumentation is available and calibrated.

2.6 The RCS is at normal operating temperature and pressure during HFT.

3.0 TEST METHOD

3.1 Verify the operation of the containment recirculation cooling units.

3.2 Verify the operation of the reactor pit cooling fans.

3.3 Verify operation of the containment purge fans (both full flow and low flow).

3.4 Perform air balance as appropriate for each subsystem.

4.0 DATA REQUIRED

4.1 Operation of interlocks and set points.

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4.2 Air balancing ~~verification~~report, including fan operating data.

~~4.3 Fan operating data.~~

4.3 Containment building temperature data.

4.4 Prefilter, high efficiency particulate air (HEPA) filter, and carbon ~~absorber~~ adsorber data for containment air clean up filtration units.

5.0 ACCEPTANCE CRITERIA

5.1 The ~~containment cooling and ventilation system~~CBVS perform as designed (refer to Section 9.4.7):

5.1.1 Containment Building cooling alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 Containment Building cooling fan performance meets design requirements.

5.1.3 Containment Building cooling dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 Containment Building cooling air balance meets design requirements.

14.2.12.8.2 Containment Building Cooling Subsystem (Test #074)

1.0 OBJECTIVE

1.1 To verify the proper operation of the containment building cooling subsystem. This system provides cool air to the reactor coolant pumps (RCP), steam generators (SG), chemical and volume control system (CVCS), control rod drive mechanism (CRDM) system and vent and drain system.

2.0 PREREQUISITES

2.1 Construction activities on the containment building cooling subsystem are complete.

2.2 Permanently installed instrumentation is functional and calibrated and is operating satisfactorily prior to performing the following test.

2.3 Test instrumentation is available and calibrated.

2.4 Plant systems required to support testing are functional.

2.5 Reactor pit cooling system is operating.

2.6 Support systems required for operation of the containment building cooling subsystem are functional.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Operate the system in the normal alignment and ~~verify system air flow and balance~~perform testing, adjusting, and balancing of the ventilation systems.

3.3 Verify that operation of interlocks and alarms meet design requirements.

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4.0 DATA REQUIRED

4.1 Air flow rates

4.2 RCS temperatures and pressures.

4.3 Setpoints at which interlocks and alarms occur.

4.4 RCP operating temperatures.

4.5 CVCS operating temperatures.

4.6 CRDMS operating temperatures.

5.0 ACCEPTANCE CRITERIA

5.1 The system temperatures are within the limits designed (refer to Section 9.4.7):

5.1.1 ~~Reactor pit cooling alarms~~Containment cooling and ventilation system, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 ~~Reactor pit cooling~~Containment cooling and ventilation system fan performance meets design requirements.

5.1.3 ~~Reactor pit cooling~~Containment cooling and ventilation system dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 The ~~reactor pit cooling~~containment cooling and ventilation system air balance meets design requirements.

14.2.12.8.3 Containment Building Ventilation System (Test #075)

1.0 OBJECTIVE

1.1 To demonstrate the proper operation of the reactor containment building ventilation system (CBVS) to maintain design temperature conditions.

2.0 PREREQUISITES

2.1 Construction activities on the CBVS have been completed.

2.2 CBVS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems are complete and functional for operation of the CBVS.

2.4 Test Instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify control logic.

3.2 Verify that operation, stroking speed and position indication of dampers meet design requirements.

3.3 Verify the system maintains the Reactor Containment at a negative pressures relative to outside air pressure (only when purge system is operating).

3.4 Verify the system maintains the differential pressure between the equipment compartment and the service compartments (only when exhaust is operating).

3.5 Verify that operation of the ventilation supply units and fans meets design requirements.

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3.6 Verify that operation of the ventilation exhaust units and fans meet design requirements.

3.7 Verify that operation of the equipment compartment cooling units meets design requirements.

3.8 Verify that operation of the equipment compartment ventilation units meets design requirements.

3.9 Verify HEPA filter efficiency, carbon ~~absorber~~adsorber efficiency, and air flow capacity.

3.10 Verify the system rated air flow and air balance.

3.11 Verify that operation of protective devices, controls, interlocks instrumentation, and alarms using actual or simulated inputs meet design requirements.

3.12 Verify that operation of the reactor containment building cooling and ventilation system to associated radiation monitors meets design requirements.

4.0 DATA REQUIRED

4.1 Air balancing verification.

4.2 Fan and damper operating data.

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4.3 Temperature data of building areas.

4.4 Setpoints of alarms, interlocks, and controls

4.5 Reactor Containment Building negative pressurization data.

4.6 HEPA filter and carbon ~~absorber~~adsorber data.

4.7 CBVS performance data in response to radiation monitors.

5.0 ACCEPTANCE CRITERIA

5.1 The CBVS operate as designed (refer to Section 9.4.7):

5.1.1 CBVS alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 CBVS fan performance meets design requirements.

5.1.3 CBVS dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.2 The CBVS meets design requirements to monitor radiation (refer to Section 7.3.1).

14.2.12.8.4 Containment Purge (Test #076)

1.0 OBJECTIVE

1.1 To demonstrate the capability of the containment purge systems, both low-flow and full-flow, to maintain the containment air quality and cleanliness at the required value during normal operation (low-flow), inspection, testing, maintenance, and refueling operations.

1.2 To demonstrate electrical independence and redundancy of power supplies.

2.0 PREREQUISITES

2.1 Construction activities in the containment have been completed and acceptable levels of cleanliness established.

2.2 Construction activities on the containment purge systems have been completed.

2.3 Containment purge system instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

4.3 Setpoints at which alarms and interlocks occur.

5.0 ACCEPTANCE CRITERIA

5.1 The ESWPBVS operates as designed (refer to Section 9.4.11):

5.1.1 ESWPBVS alarms, interlocks, protective devices, and controls (manual and automatic) function as designed.

5.1.2 ESWPBVS fan performance meets design requirements.

5.1.3 ESWPBVS dampers/valve performance (i.e., thrust, opening times, closing times, and ability to control flow) meets design requirements.

5.1.4 ESWPBVS air balance meets design requirements.

5.2 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.8.17 Reserved (Test #089)

14.2.12.8.18 ~~Reserved~~Plant Laboratory Equipment (Test #090)

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A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for the plant laboratory equipment. The following is a typical COL test; if a site-specific test will be used, the COL applicant will provide the test.

1.0 OBJECTIVE

1.1 To demonstrate proper operation of laboratory equipment used to analyze or measure radiation levels.

1.2 To demonstrate proper operation of laborator equipment used to analyze or measure isotopic concentrations (such as a mass spectrometer) of radioactive samples.

2.0 PREREQUISITES

2.1 Construction activities on laboratory equipment support systems used to analyze or measure radiation levels are complete.

2.2 Construction activities on laboratory equipment support systems used to analyze or measure isotopic concentrations of radioactive samples are complete.

2.3 Construction activities related to the installation of vendor supplied laboratory equipment used to analyze or measure radiation levels are complete. The laboratory equipment has been installed per manufacture's recommendations.

2.4 Construction activities related to the installation of vendor supplied laboratory equipment used to analyze or measure isotopic

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concentrations of radioactive samples are complete. The laboratory equipment has been installed per manufacture's recommendations.

2.5 The laboratory equipment area radiological controls (such as postings, shielding, radioactive work permits) have been implemented or are capable of being implemented.

3.0 TEST METHOD

3.1 Confirm that all drains from laboratory equipment that analyze or measure radiation levels are routed correctly and verifying that drains discharge as designed. This could be performed by pouring a liquid down the drain colored with food dye or by some other suitable means and confirm the presence of the food dye in the receiving tank.

3.2 Confirm that all drains from laboratory equipment that analyze or measure isotopic concentrations of radioactive samples are routed correctly and verifying that drains discharge as designed. This could be performed by pouring a liquid down the drain colored with food dye or by some other suitable means, and confirm the presence of the food dye in the receiving tank.

3.3 Confirm that ventilation hoods and other engineered radioactive containment devices are vented as designed. This could be accomplished by tracer gas or some other suitable means.

3.4 Measure the ventilation hood discharge flow rates for engineered devices.

3.5 Perform vendor supplied startup checks and calibrations for all laboratory equipment that analyze or measure radiation levels.

3.6 Perform vendor supplied startup checks and calibrations for all laboratory equipment that analyze or measure isotopic concentrations of radioactive samples.

4.0 DATA REQUIRED

4.1 Inspection report from verification of laboratory equipment drains.

4.2 Inspection report from verification of ventilation hood flow and routing.

4.3 Completed vendor specified laboratory equipment startup procedures.

5.0 ACCEPTANCE CRITERIA

5.1 The laboratory equipment drain interface with the plant systems performs as designed.

5.2 The laboratory equipment ventilation hood interface with the plant systems performs as designed.

5.3 The laboratory equipment checkout and calibration procedures meet design requirements.

4.0 DATA REQUIRED

4.1 Valve performance data, where required.

4.2 Valve position indications.

4.3 Response of valves to simulated failed conditions.

4.4 Position response of valves to loss of motive power.

4.5 The RCDT level, pressure and temperature.

4.6 Setpoints of alarms and interlocks.

5.0 ACCEPTANCE CRITERIA

5.1 The reactor coolant drain tank subsystem meets design requirements (refer to ~~Section 9.3.4~~Section 9.3.3.2.2).

14.2.12.9.7 ~~Equipment~~Process Drain Tank (Test #097)

14.02-104

1.0 OBJECTIVE

1.1 To verify the proper performance of the ~~EDT~~process drain tank subsystem.

2.0 PREREQUISITES

2.1 Construction activities on the ~~EDT~~process drain tank subsystem have been completed.

2.2 The ~~EDT~~process drain tank subsystem instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Verify ~~holdup tank, RCDT~~radwaste~~,~~ and reactor makeup water subsystems are functional.

3.0 TEST METHOD

3.1 Operate control valves from appropriate control positions and observe valve operation and position indication.

3.2 Verify power-operated valves fail upon loss of motive power as designed (refer to Section 9.3.4).

3.3 Fill the ~~EDT~~process drain tank from the reactor makeup water subsystem and observe indications, alarms, and interlocks.

3.4 Drain the ~~EDT~~process drain tank using an RCDT pump and observe indications, alarms, and interlocks.

3.5 Simulate a range of ~~EDT~~process drain tank temperatures while observing indications and alarms.

3.6 Simulate a range of ~~EDT~~process drain tank pressures while observing indications and alarms.

4.0 DATA REQUIRED

4.1 Valve position indications.

4.2 Position response of valves to loss of motive power.

14.02-104

4.3 The ~~EDT~~process drain tank level, pressure and temperature.

4.4 Setpoints at which alarms and interlocks occur.

5.0 ACCEPTANCE CRITERIA

5.1 The ~~EDT~~process drain tank subsystem meets design requirements (refer to ~~Section 9.3.3~~Section 9.3.3.2.2).

14.2.12.9.8 Equipment and Floor Drainage System (Test #098)

1.0 OBJECTIVE

1.1 To demonstrate that the drain lines are correctly routed to their designated destination.

1.2 To demonstrate the sump pumps operate per design including alarms and interlocks.

1.3 To demonstrate the waste tanks operate per design including alarms and interlocks.

1.4 To demonstrate the sump level instrumentation operates per design including alarms and indications to demonstrate system segregation.

~~1.5 To demonstrate the turbine building floor drain sump operates per design.~~

2.0 PREREQUISITES

2.1 Construction activities on the equipment and floor drainage system have been completed.

2.2 Equipment and floor drainage system instrumentation has been calibrated and is functional for performance of the following test.

2.3 Support systems required for operation of the equipment and floor drainage system is complete and functional.

2.4 Water is available for flow paths to be checked.

2.5 Several colors of non-toxic dye are available for verifying source of water.

3.0 TEST METHOD

3.1 Verify the operation of alarms and interlocks.

3.2 Verify sump levels as required to demonstrate that operation of the sump pumps meet design requirements.

4.0 DATA REQUIRED

4.1 Setpoints at which alarms and interlocks occur.

4.2 Sampling flow rate from each sample point.

4.3 Analytical instrument data.

4.4 Valve performance data, where required.

4.5 Valve position indication.

4.6 Position response of valves to loss of motive power.

4.7 Calculated holdup time for RCS and pressurizer samples.

5.0 ACCEPTANCE CRITERIA

5.1 The NSS meets design requirements (refer to Section 9.3.2.2.1.1).

5.2 The SASS performs as described in Section 9.3.2.2.1.3.

5.3 Verify that NSS and SASS safety-related components meet electrical independence and redundancy requirements.

14.2.12.9.11 Station Blackout Diesel Generator ~~Set~~Mechanical (Test #101)

14.02-108

1.0 OBJECTIVE

1.1 To demonstrate the station blackout diesel generator (SBODG) set system operates reliably.

2.0 PREREQUISITES

2.1 Construction activities on the SBODG system have been completed. This includes, but is not limited to the following:

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2.1.1 SBODG fuel oil system (refer to Section 8.4.1).

2.1.2 SBODG engine lube oil system (refer to Section 8.4.1).

2.1.3 SBODG cooling system (refer to Section 8.4.1).

2.1.4 SBODG starting air system (refer to Section 8.4.1).

2.1.5 SBODG air intake and exhaust systems (refer to Section 8.4.1).

2.1.6 Crankcase ventilation system (refer to Section 9.5.8).

2.2 SBODG system instrumentation has been calibrated and is functional for performance of the following test.

2.3 Support systems required for operation of the SBODG system are complete and functional.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 ~~Demonstrate that each SBODG can be started in automatic and manual from the MCR, the remote shutdown panel, and the local control~~

4.4 SBODG governor operating data.

4.5 Setpoints at which alarms and interlocks occur.

5.0 ACCEPTANCE CRITERIA

5.1 The SBODG mechanical system meets design requirements (refer to Section 8.4).

14.02-108 → 5.2 The SBODG electrical and instrumentation support systems meet design requirements (refer to Section 8.4.1).

14.2.12.9.12 Station Blackout Diesel Generator Electrical (Test #102)

1.0 OBJECTIVE

1.1 To verify the SBODGs can supply power at the rated load, voltage and frequency under design conditions.

2.0 PREREQUISITES

2.1 Construction activities on the SBODG system have been completed.

2.2 SBODG mechanical system test is completed (Test #101).

2.3 SBODG system instrumentation has been calibrated and is functional for performance of the following test.

2.4 Support systems required for operation of the SBODG system are complete and functional.

2.5 Test instrumentation is available and calibrated.

2.6 Electrical testing is complete as needed to allow the required buses to be energized.

2.7 The SBODG electrical voltage tests are complete.

~~2.8 The SBODG loads are available to be loaded onto the bus.~~

2.8 ~~SBODG~~Switchgear Building ventilation system test is completed (Test #086).

3.0 TEST METHOD

~~3.1 Demonstrate control logic and controls and response to SBO actuation signals.~~

3.1 Demonstrate 90 to 100 percent of the continuous rating of the SBODG, for an interval of not less than one hour and until temperature equilibrium has been attained.

3.2 Demonstrate that the SBODG unit starts from standby conditions and reaches required voltage and frequency within acceptable limits and time requirements.

3.3 Demonstrate by simulating a ~~loss of offsite power (LOOP)~~station blackout event that:

3.9 Demonstrate the ability to synchronize the SBODG unit with offsite power while loaded upon a simulated restoration of offsite power.

a. Transfer load to the Parallel the SBO bus with offsite power, transfer SBODG and open SBODG output circuit breaker while the unit is connected to the SBODG load.

b. Isolate the diesel generator unit and rRestore itthe SBODG to standby status.

3.10 Demonstrate that with the SBODG operating in a test mode while connected to its bus, a simulated actuation signal overrides the test mode by returning the SBODG to standby operation.

3.10 Demonstrate that, by starting and running redundantboth SBODG units simultaneously, potential common failure modes that may be undetected in single SBODG unit tests do not occur.

4.0 DATA REQUIRED

4.1 Starting and loading sequence timing.

4.1 Test data traces for SBODG output voltage, frequency, and output circuit breaker closing data during start sequencestarting, stopping and load shedding.

4.2 Running data for the parameters monitored during each of the required testing sequences.

4.3 Verification of field performance data versus shop data.

4.4 Periodic area temperatures, collected at least once per hour.

5.0 ACCEPTANCE CRITERIA

5.1 The SBODG electrical system meets design requirements (refer to Section 8.4Sections 7.4.1, 8.4, and 8.4.1.4).

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5.2 The SBODGSwitchgear Building ventilation system meets design requirements (refer to Section 9.4.10).

14.2.12.9.13 Station Blackout Diesel Generator Auxiliaries (Test #103)

1.0 OBJECTIVE

1.1 To confirm whether or not the SBODG fuel oil system provides a reliable and adequate supply to each SBODG.

1.2 To confirm whether or not the operation of the SBO engine cooling water system is adequate.

1.3 To confirm whether or not the SBO engine starting air system provides adequate amount of air for five consecutive starts of its SBODG without makeup air.

1.4 To confirm adequate operation of the SBO engine lube oil system.

3.16 Demonstrate the operation of the SBODG Lube oil pre-lube pump.

3.17 Demonstrate the operation of SBODG Lube oil heaters.

3.18 Demonstrate the operation of SBODG Lube oil alarms.

3.19 Demonstrate the operation of the SBODG lube oil transfer pump.

3.20 Verify power-operated valves fail upon loss of motive power as designed (refer to Section 8.4).

4.0 DATA REQUIRED

4.1 SBO fuel oil consumption rate.

4.2 Setpoints of alarms, interlocks, and controls.

4.3 Operating data for pumps and compressors.

4.4 Operating data for the heaters.

4.5 SBO starting air volume parameters after consecutive starts.

4.6 Position response of valves to loss of motive power.

5.0 ACCEPTANCE CRITERIA

5.1 The SBODG engine fuel oil system operates as designed (refer to Section 8.4).

5.2 The SBODG engine cooling water system operates as designed (refer to Section 8.4).

5.3 The SBODG engine starting air system operates as designed (refer to Section 8.4).

5.4 The SBODG engine lube oil system operates as designed (refer to Section 8.4).

14.2.12.9.14 Emergency Diesel Generator ~~Set~~Mechanical (Test #104)

14.02-110

1.0 OBJECTIVE

1.1 To demonstrate the emergency diesel generator (EDG) set system operates reliably.

1.2 To demonstrate electrical independence and redundancy of power supplies.

1.3 To verify that EDG diesel generator and auxiliary system alarms, interlocks, and control functions perform as designed.

2.0 PREREQUISITES

2.1 Construction activities on the EDG system have been completed. This includes, but is not limited to the following:

2.1.1 EDG fuel oil system (refer to Section 9.5.4).

2.1.2 EDG engine lube oil system (refer to Section 9.5.7).

2.1.3 EDG cooling system (refer to Section 9.5.5).

2.1.4 EDG starting air system (refer to Section 9.5.6).

2.1.5 EDG air intake system (refer to Section 9.5.8).

2.1.6 EDG exhaust system (refer to Section 9.5.8).

14.02-110 → 2.1.7 Crankcase ventilation system (refer to Section 9.5.8)

2.2 EDG system instrumentation has been calibrated and is functional for performance of the following test.

2.3 Support systems required for operation of the EDG system are complete and functional.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Demonstrate that each EDG can be started in automatic and manual ~~from the MCR and the remote shutdown panel~~using the SICS and PICS control interfaces.

3.2 Demonstrate that the following mechanical and electrical trips are functional (includes protective trips bypass tests).

3.2.1 Engine over speed (electrical and mechanical).

3.2.2 Generator differential protection.

3.2.3 Low-low lube oil pressure.

3.2.4 Generator electrical protection.

3.2.5 Essential service water supply low pressure.

3.2.6 Low expansion tank level.

3.2.7 High pressure crankcase.

3.2.8 Fuel oil low pressure.

3.2.9 High-high temperature lube oil out.

3.2.10 High-high temperature jacket water.

3.2.11 Low-low lube oil sump tank level.

3.2.12 Stop button located near engine.

3.2.13 Electronic governor failure.

3.3 Demonstrate that the following parameters are correctly monitored in the control room and at the local panel:

3.3.1 Lube oil temperature and pressures.

3.3.2 Bearing temperatures.

3.3.3 Cooling water temperatures and pressures.

3.3.4 Speed (rpm).

3.3.5 Starting air pressure.

3.4 Demonstrate the operation of the following status indications:

3.4.1 Cooling water not available.

3.4.2 EDG output breaker positionracked out.

3.4.3 EDG over speed.

3.4.4 Loss of control power.

3.4.5 Generator fault.

3.4.6 Low air and oil pressure.

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3.4.7 Maintenance mode.

3.5 Demonstrate 25 consecutive startss and load tests, without failuresing capability.

3.6 Demonstrate full load capability.

3.7 Demonstrate EDG speed control.

3.8 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

3.9 Demonstrate that EDG instrumentation operates over the design range using actual or simulated signals.

3.10 Demonstrate that EDG alarms and interlocks occur as designed.

3.11 Demonstrate that the EDG instrumentation responds as designed to actual or simulated limiting malfunctions or failures.

3.12 Demonstrate that the EDG instrumentation response meets the accident analysis assumptions, such as time response, accuracy, and control stability.

4.0 DATA REQUIRED

4.1 EDG engine operating parameters.

4.2 EDG engine consecutive starts and loading data.

4.3 Setpoints of EDG trips.

4.4 EDG governor operating data.

4.5 Setpoints at which alarms and interlocks occur.

5.0 ACCEPTANCE CRITERIA

5.1 The EDG mechanical system meets design requirements (refer to Section 8.3.1Sections 7.3.1.2.12, 8.3.1, and 8.4.1):

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5.1.1 Manual and automatic controls.

5.1.2 Trips, alarms, interlocks, status lights, and system controls.

5.1.3 System responds as required to actual or simulated signals.

5.2 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.9.15 Emergency Diesel Generator Electrical (Test #105)

1.0 OBJECTIVE

1.1 To verify the EDGs can supply power at the rated load, voltage, and frequency under design conditions.

1.2 To demonstrate electrical independence and redundancy of power supplies.

1.3 To verify that EDG alarms, interlocks, and control functions perform as designed.

2.0 PREREQUISITES

2.1 Construction activities on the EDG system have been completed.

2.2 EDG mechanical system test is completed (Test #104).

2.3 EDG system instrumentation has been calibrated and is functional for performance of the following test.

2.4 Support systems required for operation of the EDG system are complete and functional.

2.5 Test instrumentation is available and calibrated.

2.6 Electrical testing is complete as needed to allow the buses to be energized.

2.7 EDG electrical voltage tests are complete.

2.8 Engineered safety feature (ESF) loads are available to be loaded onto the bus.

2.9 EDGEmergency Power Generating Building ventilation system test is completed. (Test #084).

2.10 The demonstration of EDGs must be sequenced so that loading of divisional power or alternate supplied loads are not confused with power from another EDG.

14.02-111

3.0 TEST METHOD

3.1 Demonstrate control logic and controls including the EDG load sequencer and response to ESF actuation signals.

3.1.1 Demonstration of the control logic and controls, including the protection system, which sequences EDG loads and responds to ESF actuation signals.

3.1.2 Demonstration of the EDG load carrying capability with the alternate feed connected between divisions (when one EDG is inoperable).

3.2 Demonstrate EDG rated load capability by operating loaded for the indicated times without exceeding the manufacturer's design limits:Demonstrate 90 to 100 percent of the continuous rating of the

~~emergency diesel generator, for an interval of not less than one hour and until temperature equilibrium has been attained.~~

a. Loaded at 90 to 100 percent of the continuous rating for the time required to reach engine temperature equilibrium plus one hour.

b. Following the load test described in item a), loaded at 105 to 110 percent for a period of two hours.

3.3 Demonstrate that the EDG starts from standby conditions, reaches required voltage and frequency within acceptable limits and time requirements.

3.4 Demonstrate by simulating a LOOP that:

3.4.1 The emergency buses are de-energized and the loads are shed from the emergency buses.

3.4.2 The EDG starts on the auto-start signal from its standby conditions, attains the required voltage and frequency within acceptable limits and time, energizes the auto-connected shutdown loads through the load sequencer and operates while loaded with its shutdown loads for greater than or equal to five minutes.

3.5 Demonstrate that on an SIAS, the EDG starts on the auto-start signal from its standby conditions, attains the required voltage and frequency within acceptable limits and time, and operates for greater than or equal to five minutes.

3.6 Demonstrate that on a combined SIAS and a LOOP that:

3.6.1 The emergency buses are de-energized and the loads are shed from the emergency buses.

3.6.2 The EDG starts on the auto-start signal from its standby conditions, attains the required voltage and frequency within acceptable limits and time, energizes the auto-connected shutdown loads through the load sequencer, and operates while loaded with its shutdown loads for greater than or equal to five minutes.

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3.6.3 The EDG starts on the auto-start signal from its standby conditions while aligned to supply alternate feed loads. The EDG attains the required voltage and frequency (with alternate feed loads) within acceptable limits and time, energizes the auto-connected shutdown loads through the load sequencer, and operates while loaded with its shutdown loads for greater than or equal to five minutes.

3.7 Demonstrate the EDGs capability to reject a loss of the largest single load while operating at power factor ~~between 0.8 and~~of ≤ 0.9, and verify that the voltage and frequency requirements are met and that the EDG ~~unit shall not trip on over speed~~output frequency is ≤ 63 Hz.

3.14 Demonstrate that, by starting and running redundant EDG units simultaneously, potential common failure modes that may be undetected in single EDG unit tests do not occur.

3.15 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

3.16 Verify that EDG instrumentation operates over the design range using actual or simulated signals.

3.17 Verify that EDG alarms and interlocks occur as designed.

3.18 Verify that the EDG instrumentation responds as designed to actual or simulated limiting malfunctions or failures.

3.19 Verify that the EDG instrumentation response meets the accident analysis assumptions, such as time response, accuracy, and control stability.

3.20 Demonstrate EDG load rejection capability by operating loaded at 105 to 110 percent, opening the EDG output circuit breaker, and verifying speeds and voltages that will cause tripping or component damage are not exceeded.

4.0 DATA REQUIRED

4.1 Starting and loading sequence timing.

4.2 Test data traces for starting, stopping and load shedding.

4.3 Running data for the parameters monitored during each of the required testing sequences.

4.4 Verification of field performance data versus shop data.

4.5 Periodic area temperatures, collected at least once per hour.

5.0 ACCEPTANCE CRITERIA

5.1 The EDG electrical system meets design requirements (refer to ~~Section 8.3.1~~Sections 7.3.1.2.12 and 8.3.1):

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5.1.1 Verify the EDG provides power to essential safety equipment if there is a simulated loss of normal power.

- Table 14.3-1 Item 1-56.

5.2 The EDG ventilation system meets design requirements (refer to Section 9.4.9).

5.3 ~~Verify that s~~Safety-related components meet electrical independence and redundancy requirements.

1.2 To verify the power generated by the turbine generator can be fed to grid through the switchyard ~~and preferred power system~~.

2.0 PREREQUISITES

2.1 Construction activities on the switchyard and preferred power system have been completed.

2.2 Offsite power system instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems are completed and functional for operation of the switchyard and preferred power system.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify operation of the switchyard protective relaying system.

3.2 Verify operation of switchyard power ~~current~~circuit breakers and motor-operated disconnects from the following, as applicable:

3.2.1 ~~The MCR~~PICS and SICS controls.

3.2.2 Switchyard relay house.

3.2.3 Switchyard local control cabinet.

~~3.3 Verify operation of interlock between the separate offsite power connections.~~

3.3 Verify operation of the switchyard 125 Vdc auxiliary supply system
14.02-112 → and its associated controls, alarms, and ~~batteries~~dual battery supplies.

3.4 Verify the operation of the switchyard 480 Vac auxiliary power system and its associated controls, alarms, and annunciators.

4.0 DATA REQUIRED

4.1 Setpoints at which alarms and interlocks occur.

4.2 Setpoint of protective relays.

5.0 ACCEPTANCE CRITERIA

5.1 The switchyard and preferred power system operates as designed (refer to Section 8.2).

14.2.12.10.2 ~~Unit Main Power System~~Main Generator (Test #109)

1.0 OBJECTIVE

~~1.1 To demonstrate that the unit main power system is capable of supplying power to designated house loads.~~

1.1 To demonstrate that the ~~unit main power system~~turbine generator is capable of transmitting power ~~from the main generator~~ to the transmission system and designated house loads through the switchyard.

2.0 PREREQUISITES

2.1 Construction activities on the ~~unit main power system~~turbine generator and support systems have been completed.

2.2 The offsite power distribution system is available.

2.3 Buses and equipment have been voltage tested with acceptable results.

2.4 Equipment has been visually inspected.

2.5 Control power is available.

2.6 Plant conditions are such that the main generator can be operated.

3.0 TEST METHOD

~~3.1 Demonstrate the ability of the unit transformers to supply power to the unit auxiliary transformers from the offsite power source.~~

3.1 Demonstrate the ability of the ~~unit~~main step-up transformers to transmit power from the main generator to the offsite power transmission system at rated voltage and load.

3.2 Demonstrate the ability of the main generator to generate designed voltage and load.

3.3 Demonstrate the ability of the unit auxiliary transformers to supply station loads.

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3.4 Verify the operation of each of the generator circuit breakers, in the plant switchyard.

3.5 Verify the operation of interlocks, alarms and protective relays.

3.5.1 Verify that the backup protection scheme works for simulated single failures by verifying operation of the primary and backup relay systems.

3.6 Verify the operation of the main generator auxiliary systems.

4.0 DATA REQUIRED

4.1 ~~Main generator~~Turbine generator operating data at load.

4.2 ~~Unit~~Main step-up transformer operating data.

~~4.3 Unit auxiliary transformer operating data.~~

4.3 ~~Setpoints of alarms interlocks and controls~~Alarm values, interlock actuation valves, and plant operating data.

5.0 ACCEPTANCE CRITERIA

5.1 The ~~unit main power system~~turbine generator, output breaker, and step-up transformer operates as designed (refer to Section 8.2.1).

14.2.12.10.3 Class 1E Uninterruptible Power Supply (Test #110)

1.0 OBJECTIVE

1.1 To demonstrate the Class 1E DCuninterruptible power supply (EUPS) systems supply power as designed in required operating modes.

1.2 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the Class 1E DCuninterruptible power supply (EUPS) system have been completed.

2.2 Class 1E DC power EUPS system instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the Class 1E DC powerEUPS system are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 BEUPS batteries are fully charged.

2.6 Load banks are available for discharge test.

2.7 Operation of breakers and cables has been verified.

2.8 Ventilation systems are in operation, as needed.

2.9 Buses and associated equipment have been meggered with acceptable results.

2.10 EUPS components have been visually inspected.

3.0 TEST METHOD

3.1 Demonstrate that the batteries and battery chargers meet design capacities by performing discharge and charging tests as follows:.

a. Perform battery modified performance discharge or service test per IEEE Standard 450-2002 as endorsed by RG 1.129 with exceptions.

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b. Perform battery charger capacity test to verify battery charger output meets design criteria.

3.2 Verify that EUPS battery minimum bank and individual cell limits are not exceeded during battery discharge test.

3.3 Verify that operation of the inverters, manual transfer switches, and frequency synchronization, and blocking diodes meets design requirements.

3.4 Verify that the inverters automatically transfer input to the battery upon loss of preferred power while maintaining uninterrupted power output.Verity operation of the EUPS inverters as follows:

14.2.12.10.4 Non–Class 1E Uninterruptible Power Supply (Test #111)

1.0 OBJECTIVE

1.1 To demonstrate the operation of the following systems:non-Class 1E uninterruptible power supply (NUPS) system.

1.1.1 The 250 Vdc auxiliary power system.

2.0 PREREQUISITES

2.1 Construction activities on the non-Class 1E DC powerNUPS system have been completed.

2.2 Non-Class 1E DC powerNUPS system instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the non-Class 1E-powerNUPS system are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 NUPS Bbatteries are fully charged.

2.6 Load banks are available for discharge test.

2.7 Operation of breakers and cables is verified.

2.8 Ventilation systems are in operation, as needed.

2.9 Buses and associated equipment have been meggered with acceptable results.

2.10 The NUPS equipment has been visually inspected.

3.0 TEST METHOD

3.1 Demonstrate that the batteries and battery charges of the 250 Vdc auxiliary power system meet design capacities by performing discharge and charging tests as follows:.

a. Perform battery modified performance discharge test or service test per IEEE 450-2002 as endorsed by RG 1.129 with exceptions.

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b. Perform battery charger capacity test to verify battery charger output meets design criteria.

3.2 Verify that minimum bank and individual cell limits are not exceeded during battery discharge tests.

3.3 Verify that operation of the inverters, manual transfer switches, frequency synchronization and blocking diodes meets design requirements.

2.3 Support systems required for operation of the normal lighting system are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 Equipment has been visually inspected.

2.6 Normal lighting system power is available.

3.0 TEST METHOD

3.1 Demonstrate the functionality of the source and feeder circuit breakers ~~locally and remotely~~.

~~3.2 Demonstrate the functionality of the bus interlocks alarms and protective relays.~~

~~3.3 Verify the operation of indication and automatic responses.~~

3.2 Verify normal lighting levels for each system with other lighting systems de-energized.

4.0 DATA REQUIRED

4.1 ~~Setpoints at which alarms, interlocks, and protective relays occur~~Plant area illumination levels.

5.0 ACCEPTANCE CRITERIA

14.02-122

5.1 Normal lighting systems operate as designed (refer to Section 9.5.3).

14.2.12.10.7 ~~Reserved~~Heat Tracing (Test #114)

1.0 OBJECTIVE

1.1 To demonstrate that the temperature maintenance portion of the heat tracing system meets design requirements.

1.2 To demonstrate that the freeze protection portion of the heat tracing system meets design requirements.

1.3 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the temperature maintenance portion of the heat tracing system have been completed.

2.2 Construction activities on the freeze protection portion of the heat tracing system have been completed.

2.3 Test instruments are calibrated per applicable procedures and are available; this includes temperature-sensors for remote readings if insulation is installed.

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2.4 Support systems that provide power to the heat tracing control cabinets are functional and available for testing.

3.0 TEST METHODS

3.1 Simulate temperatures to the freeze protection cabinets that are below the low temperature setpoint and verify that the heat tracing that provides freeze protection is energized.

3.2 Simulate temperatures to the freeze protection cabinets that are above the low temperature setpoint and verify that the heat tracing that provides freeze protection is de-energized.

3.3 Demonstrate that the safety-related freeze protection system remains powered from the redundant emergency power supply buses by selectively removing power and verifying staggered freeze protection loss.

3.4 Simulate temperatures to the temperature maintenance cabinets that are below the low temperature setpoint and verify that the heat tracing that provides temperature maintenance is energized.

3.5 Simulate temperature to the temperature maintenance cabinets that are above the low temperature setpoint and verify that the heat tracing that provides temperature maintenance is de-energized.

3.6 Demonstrate that the safety-related temperature maintenance system remains powered from the redundant emergency power supply buses by selectively removing power and verifying staggered temperature maintenance loss.

4.0 DATA REQUIRED

4.1 Simulated temperature inputs.

4.2 Record of energized freeze protection cabinet circuits.

4.3 Piping temperature with freeze protection circuits energized.

4.4 Record of energized temperature maintenance circuits energized.

5.0 ACCEPTANCE CRITERIA

5.1 The freeze protection system functions as designed (refer to Section 8.3.1.4).

5.2 The temperature maintenance system functions as designed (refer to Section 8.3.1.4).

14.2.12.10.8 Emergency Lighting System (Test #115)

1.0 OBJECTIVE

1.1 To demonstrate that the emergency lighting system provides adequate illumination to operate equipment during emergency operations.

1.2 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the emergency lighting system have been completed.

2.2 Test instruments are calibrated per applicable procedures and available.

3.0 TEST METHODS

3.1 Demonstrate that the emergency lighting system provides levels of illumination as required in designated control areas.

3.2 Demonstrate that the emergency lighting system provides levels of illumination in other designated areas of the plant.

3.3 Demonstrate that the emergency lighting system remains energized ~~comes on~~ upon loss of normal lighting.

14.02-118

3.4 Demonstrate that the battery operated emergency lights provide adequate illumination at designated locations.

3.5 Demonstrate that the battery operated emergency lights are capable of providing lighting for the designated amount of time.

3.6 ~~Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.~~Demonstrate that the MCR emergency lighting is powered from redundant emergency power supply system buses by selectively removing power and verifying staggered lighting loss.

3.7 Demonstrate that the remote shutdown station (RSS) emergency lighting is powered from redundant emergency power supply system buses by selectively removing power and verifying staggered lighting loss.

4.0 DATA REQUIRED

4.1 Illumination levels in designated areas.

4.2 Battery powered lighting data.

5.0 ACCEPTANCE CRITERIA

5.1 The emergency lighting system operates as designed (refer to Section 9.5.3).

~~5.2 Verify that safety-related components meet electrical independence and redundancy requirements.~~

14.2.12.10.9 6.9 kV Class 1E Emergency Power Supply System (Test #116)

1.0 OBJECTIVE

1.1 To demonstrate the operation of 6.9 kV Class IE emergency power supply system (EPSS) equipment.

14.02-115

1.1.1 Normal supply.

1.1.2 Alternate supply

1.1.3 Automatic transfer from normal to alternate supply.

1.2 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the 6.9 kV Class IE emergency power systemEPSS equipment -have been completed.

2.2 The 6.9 kV Class 1E emergency power systemEPSS equipment instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the 6.9 kV Class 1E emergency power systemEPSS are completed and functional.

2.4 Test Instrumentation is available and calibrated.

2.5 All 6.9 kV feeders and buses voltage tested with acceptable results.

2.6 6.9 kV power is available from the normal and alternate ESF transformeroffsite power sources.

2.7 Switchgear assembly, breakers, control and protective equipment, and circuits have been inspected and tested and are capable of being placed into service.

2.8 The EDG and emergency AC SBODG sources are available.

3.0 TEST METHOD

3.1 Demonstrate the functionality of the switchgear and load center feeder and cross-tie protective circuit breakers locally and remotely.

3.2 Demonstrate the functionality of the bus interlocks, alarms, and protective relays.

3.3 Verify the operation of indication and automatic responses.

3.4 Load the systems to the extent practical and verify full load voltage is within system design parameters.

3.4.1 Verify the capability of 6.9 kV and 480 V bus loads to start and operate as designed when connected to the respective Class 1E 6.9 kV BDA buses at ±105 percent nominal voltage.

14.02-115

3.5 Verify the 6.9 kV and 480 V safety-related systems load shed as designed on undervoltage, as described in Section 8.3.1.1.3.

3.6 ~~Verify the 6.9 kV Class 1E buses can be energized from the following power sources:~~ Verify the applicable 6.9 kV Class 1E buses can be energized from the following normal sources:

3.6.1 ~~Respective emergency auxiliary transformer.~~ Respective emergency auxiliary transformer.

3.6.2 ~~Respective EDG.~~ Respective EDG.

3.6.3 ~~Respective alternate AC source.~~ Respective SBODG.

3.7 Veirfy the applicable 6.9 kV Class 1E buses can be energized from the following alternate sources:

3.7.1 Alternate emergency auxiliary transformer.

3.7.2 EDG via alternate feed.

3.8 Verify that the automatic bus transfer occurs when a simulated normal emergency auxiliary transformer fault is detected. Verify that loads are reconnected to the alternate supply.

14.02-115

3.9 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

3.10 Demonstrate control logic and controls including the load sequencer function in the protection system and response to ESF actuation signals.

4.0 DATA REQUIRED

4.1 ~~Full load bus voltage data.~~ Bus voltage data at maximum attainable load.

4.2 ~~Setpoints~~ Values at which alarms, interlocks, and protective relays occur.

14.02-115

4.3 Data collected should be sufficient to demonstrate ~~S~~system response to ~~low~~ bus undervoltage and degraded voltage condition as described in Section 8.3.1.1.3.

5.0 ACCEPTANCE CRITERIA

5.1 The 6.9 kV Class 1E emergency power system operates as designed (refer to Section 8.3.1).

5.2 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.10.10 480 V ~~Class 1E~~ Emergency Power Supply System (Test #117)

1.0 OBJECTIVE

1.1 To demonstrate the operation of the 480 V Class 1E ~~emergency power system~~ EPSS.

1.2 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the 480 V ~~Class 1E emergency power system~~EPSS have been completed.

2.2 The 480 V ~~Class 1E emergency power system~~ EPSS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the 480 V ~~Class 1E emergency power systems~~ EPSS are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 Buses and equipment meggered with acceptable results.

2.6 Applicable equipment has been visually inspected.

3.0 TEST METHOD

3.1 Demonstrate the functionality of the 480 Vac source and feeder circuit breakers locally and remotely, as applicable.

3.2 Demonstrate the functionality of the bus interlocks alarms and protective relays.

3.3 Verify the operation of indication and automatic responses.

3.4 Perform energization of 480 V~~ac Class 1E emergency power system~~ EPSS.

3.5 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

4.0 DATA REQUIRED

4.1 Setpoints at which alarms, interlocks, and protective relays occur.

5.0 ACCEPTANCE CRITERIA

5.1 The 480 V Class 1E emergency power system operates as designed (refer to Section 8.3.1).

5.2 Verify that safety-related components meet electrical independence and redundancy requirements.

14.2.12.10.11 13.8 kV Normal Power Supply System (Test #118)

1.0 OBJECTIVE

1.1 To demonstrate the operation of the 13.8 kV normal power supply system (NPSS).

14.02-116 → 1.1.1 Verify ability of 13.8 kV bus to be supplied power from the normal offsite supply.

14.02-116

1.1.2 Verify ability of 13.8 kV bus to be supplied power from the alternate offsite supply.

1.2 To demonstrate electrical independence and redundancy of safety-related RCP breaker protective devices.

2.0 PREREQUISITES

2.1 Construction activities on the 13.8 kV ~~normal power system~~NPSS have been completed.

2.2 13.8 kV ~~normal power system~~NPSS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the 13.8 kV ~~normal power system~~NPSS are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 Normal auxiliary transformers available.

2.6 All 13.8 kV feeders and buses have been voltage tested with acceptable results.

2.7 Switchgear assembly, breaker, control and protective equipment, and circuits have been inspected and tested and are capable of being placed into service.

3.0 TEST METHOD

3.1 Demonstrate the functionality of the switchgear and load center 13.8 kV feeder circuit breakers locally and remotely.

3.2 Demonstrate the functionality of the bus interlocks, alarms, and protective relays.

3.3 Verify the operation of indication and automatic responses.

14.02-116

3.3.1 Simulate a loss of normal offsite supply and verify automatic re-alignment to the alternate offsite supply.

3.4 Demonstrate the functionality of the feeder circuit breakers from the normal transformers to the NPSS locally and remotely.

3.5 Check electrical independence and redundancy of RCP breaker protective devices by selectively removing power and determining that loss of function (ability to trip RCP) does not occur.

4.0 DATA REQUIRED

4.1 Setpoints at which alarms, interlocks, and protective relays occur.

5.0 ACCEPTANCE CRITERIA

5.1 The 13.8 kV normal power system operates as designed (refer to Sections 8.2 and 8.3.1).

5.0 ACCEPTANCE CRITERIA

5.1 The 13.8 kV normal power system operates as designed (refer to Sections 8.2 and 8.3.1).

5.2 Safety-related components meet electrical independence and redundancy requirements.

14.2.12.10.12 6.9 kV Normal Power Supply System (Test #119)

1.0 OBJECTIVE

1.1 To demonstrate the operation of the 6.9 kV normal power supply system (NPSS).

2.0 PREREQUISITE

2.1 Construction activities on the 6.9 kV ~~normal power system~~NPSS have been completed.

2.2 The 6.9 kV ~~normal power system~~NPSS instrumentation are calibrated and are operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the 6.9 kV ~~normal power system~~NPSS are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 All 6.9 kV feeders and buses have been voltage tested with acceptable results.

2.6 The 6.9 kV power is available from the following:

2.6.1 Normal auxiliary transformer.

2.6.2 Respective ~~alternate AC source~~SBODG.

2.7 Switch gear assembly, breakers, and control and protective equipment and circuits have been inspected and tested and are capable of being placed into service.

3.0 TEST METHOD

14.02-117

3.1 ~~Demonstrate the functionality of the feeder protective circuit breakers from the permanent non-safety buses to the safety loads buses.~~Demonstrate the operation and functionality of the 480 Vac source and feeder circuit breaker (isolation devices) to locally and remotely isolate non-Class 1E systems.

~~3.2 Demonstrate the functionality of the feeder protective circuit breakers from the unit auxiliary transformer to the non-safety loads locally and remotely.~~

3.2 Demonstrate the functionality of the switchgear and load center feeder ~~and cross-tie protective~~ circuit breakers ~~for the permanent non-safety loads~~ locally and remotely.

14.02-119

14.2.12.10.16 Severe 12-Hour Accident Uninterruptible Power Supply (Test #123)

1.0 OBJECTIVE

1.1 To demonstrate the severe accident DC power systems12-hour uninterruptible power supply powersystem (12 UPS) supply power as designed in required operating modes.

2.0 PREREQUISITES

2.1 Construction activities on the severe accident DC power system12 UPS have been completed.

2.2 Severe accident DC power system12 UPS instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the severe accident DC power system12 UPS are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 B12 UPS batteries are fully charged.

2.6 Load banks are available for discharge test.

2.7 Operation of breakers and cables has been verified.

2.8 Ventilation systems are in operation, as needed.

14.02-119

2.9 Megger and perform visual inspection of buses and associated components.

3.0 TEST METHOD

3.1 Demonstrate that the 12 UPS batteries and battery chargers meet design capacities by performing discharge and charging tests.

3.2 Verify that minimum bank and individual cell limits are not exceeded during battery discharge test.

3.3 Verify that operation of the inverters, manual transfer switches, and frequency synchronization, and blocking diodes meets design requirements.

3.4 Verify that the inverters automatically transfer input to the battery upon loss of preferred power while maintaining uninterrupted power output.Verify operation of the 12 UPS inverters as follows:

a. Verify operation of each 12 UPS inverter with the respective UPS battery charger removed from service.

b. Verify each 12 UPS inverter static bypass switch forward and reverse transfer operation.

3.5 Place the battery chargers on equalize and verify DC equalizing voltage shall not result in driving the inverter, relieving the rectifier from carrying the inverter load.Place each battery charger in equalize mode and verify battery charger, battery, and inverter performance meets design requirements.

3.6 Verify that operation of protective devices, controls, interlocks, alarms, computer inputs, and ground detection meet design requirements.

3.7 Verify that operation of the vital instrumentation and control power status information subsystem meets design requirements.

14.02-120

3.8 Verify proper operation of bus transfer devices.Verify operation of the AC/DC and DC/DC converter output to the I&C cabinets by alternately removing power and verifying continued power to the I&C cabinet from the converter remaining in operation.

3.9 Demonstrate that the batteries and battery charger meet design capacities by performing discharge and charging tests as follows:

3.9.1 Perform battery modified performance discharge or service test per IEEE Standard 450-2002 as endorsed by RG 1.129 with exceptions.

3.9.2 Perform battery charger capacity test to verify battery charger output meets design criteria.

4.0 DATA REQUIRED

4.1 Battery voltage and load current without charger.

4.1 Charger float voltage and current.

4.2 Test discharge recordings of battery terminal voltage, current, temperature, capacity in ampere hours, and individual cell voltages.

4.3 Charger voltage and current as battery eliminator.

4.4 Inverter voltage, frequency, and current from preferred source.

4.3 Inverter voltage, frequency, and current. from battery source.

4.4 SetpointValues at which alarms, interlocks, and controls occur.

4.5 System status information subsystem indications.

4.6 Capacity estimates of the 12 UPS batteries.

5.0 ACCEPTANCE CRITERIA

5.1 The severe accident uninterruptible power system12 UPS supplies the loads as designed (refer to Sections 8.3.1 and 8.3.2).

3.9 Verify that the SMS system response meets the accident analysis assumptions, such as time response, accuracy, and control stability.

3.10 Verify redundancy and electrical independence of the SMS design (internal and external battery power supplies).

4.0 DATA REQUIRED

4.1 Record sensor response to simulated seismic inputs.

5.0 ACCEPTANCE CRITERIA

5.1 The as-built location of the SMS equipment is as shown on the plant layout drawings.

5.2 The SMS system can compute the cumulative absolute velocity (CAV) and provide indication of the CAV. ~~in the main control room (MCR).~~

5.3 The SMS has sufficient dynamic range.

5.4 The SMS has a sufficient bandwidth.

5.5 The SMS has a sufficient sampling rate.

5.6 The SMS has a sufficient trigger level.

5.7 The SMS backup battery has sufficient capacity to power its instruments for continuous operation as described in the equipment specification.

5.8 The SMS functions as described in Section 3.7.4.

14.2.12.11.3 Boron Concentration Measurement System (Test #126)

1.0 OBJECTIVE

1.1 To demonstrate proper operation of the safety-related boron concentration measurement system (BCMS). The system measures the nuclear cross-section of CVCS fluid and ~~calculates a corresponding boron concentration~~provides this information to the PS for calculation of the corresponding boron concentration.

1.2 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 The BCMS has been calibrated and is operating satisfactorily prior to performing the following test.

2.2 Support systems required for BCMS operation are complete and functional.

2.3 Verify that factory acceptance testing has been completed.

2.4 Verify proper operation of alarm, control and indication functions.

3.0 TEST METHOD

3.1 Observe boron cross-section measurement indications using the built-in test features.

3.2 Formulate sample concentrations of 500 ppmB, 1000 ppmB, 1500 ppmB and 2000 ppmB using naturally occurring boron-10 isotopic enrichments.

3.3 Flush test samples through the ~~boron instrumentation system~~associated BCMS piping while observing system response.

3.4 Formulate sample concentrations of 500 ppmB, 1000 ppmB, 1500 ppmB and 2000 ppmB using 37 percent enriched boron-10.

3.5 Flush the samples through the charging pump suction pipe while observing system response.

3.6 Verify that the BCMS system operates over the design range using actual or simulated signals.

3.7 Verify that the BCMS system responds as designed to actual or simulated limiting malfunctions or failures.

3.8 Verify that the BCMS system response meets the accident analysis assumptions, such as time response, accuracy, and control stability.

14.02-105

3.9 ~~Verify redundancy and~~ Check electrical independence and redundancy of the BCMS ~~design~~power supplies for safety-related functions by selectively removing power and determining loss of function.

4.0 DATA REQUIRED

4.1 Pulse rates and boron cross-section measurement output (boron concentration).

4.2 Alarm setpoints and actuation levels.

5.0 ACCEPTANCE CRITERIA

5.1 The BCMS equipment is installed in the locations shown on the plant layout drawings.

5.2 The BCMS provides input signals for the engineered safety feature function described in the equipment specification.

5.3 The Class 1E BCMS equipment receives power from its respective Class 1E division.

5.4 The BCMS functions as described in Sections 9.3.4.2.3.4~~9.3.4~~ and ~~7.1.1~~7.1.1.5.4.

5.5 Veirfy that BCMS safety-related components meet electrical independence and redundancy requirements.

5.4 Verify that safety-related components meet electrical independence and redundancy requirements.

5.5 The excore instrumentation system functions as described in Section 7.1.1.5.3.

14.2.12.11.19 Radiation Monitoring System (Test #143)

1.0 OBJECTIVE

1.1 To verify the functional performance of the airborne radiation monitoring system.

1.2 To verify the functional performance of the area radiation monitoring system.

2.0 PREREQUISITES

2.1 Construction activities on the safety-related radiation monitoring system have been completed with all radiation monitors positioned per Table 12.3-3.

2.2 Radiation monitoring system instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

14.02-107

2.3 Support systems required for operation of the radiation monitoring system are completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 Calibration check source is available, as required.

2.6 Verify that factory acceptance testing has been completed.

2.7 Verify proper operation of alarm setpoints, operation, control, and indication functions.

3.0 TEST METHOD

3.1 Verify the operation of the radiation monitor using a check source and external test equipment, as applicable.

3.2 Check the self-testing feature of the radiation monitor, as applicable.

3.3 Compare local and remote indications.

3.4 Verify as--designed local and remote alarm actuations, as applicable.

3.5 Simulate automatic initiation signals and record control actuations.

3.6 Verify that the radiation monitoring system operates over the design range using actual or simulated signals.

3.7 Verify that the radiation monitoring system responds as designed to actual or simulated limiting malfunctions or failures.

3.8 Verify that the radiation monitoring system response meets the accident analysis assumptions, such as time response, accuracy, and control stability.

3.9 Verify redundancy and electrical independence of the radiation monitoring system design.

4.0 DATA REQUIRED

4.1 Radiation monitor response to a check source, as applicable.

4.2 Technical data associated with the source.

4.3 Local and remote responses to test signals, as applicable.

4.4 Signals levels necessary to cause alarm actuation.

5.0 ACCEPTANCE CRITERIA

5.1 The radiation monitoring system generates a Main Control Room air intake activity measurement signal as input to the protection system

5.2 The airborne and area radiation monitors function as described in Sections 7.1.1.5.5~~Sections 7.1.1~~, 7.3.1, 7.5.1, and 12.3.4. The airborne and area radiation monitors are listed in Table 11.5-1 and Table 12.3-3, respectively.

14.02-106

14.2.12.11.20 Process and Effluent Radiological Monitoring System (Test #144)

1.0 OBJECTIVE

1.1 To verify that the process and effluent radiological monitoring system can detect and record specific radiation levels, and to verify alarms and interlocks.

2.0 PREREQUISITES

2.1 Construction activities on the process and effluent radiological monitoring system have been completed.

2.2 Process and effluent radiological monitoring system instrumentation has been calibrated and is operating satisfactorily prior to performing the following test.

2.3 Support systems required for operation of the process and effluent radiological monitoring system is completed and functional.

2.4 Test instrumentation is available and calibrated.

2.5 Calibration check source is available, as necessary.

2.6 Verify that factory acceptance testing has been completed.

2.7 Verify proper operation of alarm, control, and indication functions.

3.0 TEST METHOD

3.1 Verify calibration and operation of the monitor using a check source and external test equipment, as necessary.

3.2 Check the self-testing feature of the monitor.

5.0 ACCEPTANCE CRITERIA

5.1 The process radiation monitor of the process sampling functions as follows:

5.1.1 Radiation monitors are installed on process paths as shown on plant layout drawings.

5.1.2 The radiation monitors have been source checked to verify response.

5.1.3 Preliminary alarms setpoints have been established and calibrated in the equipment.

5.2 Process radiation monitors function as described in Section 11.5.4.

14.2.12.11.27 Personnel Radiation Monitors (Test #160)

14.02-100

A COL applicant that references the U.S. EPR design certification will provide site-specific test abstract information for personnel radiation monitors. The following is a typical COL test; if a site-specific test will be used, the COL applicant will provide the test.

1.0 OBJECTIVE

1.1 To demonstrate proper operation of personnel radiation monitors.

2.0 PREREQUISITES

2.1 Construction activities on personnel radiation monitor support systems are complete.

2.2 Construction activities related to the installation of vendor supplied personnel radiation monitors are complete. The personnel radiation monitors have been installed per manufacture's recommendations.

2.3 A suitable test source is available for testing.

2.4 A portable radiation monitoring device is available for measuring the background radiation.

3.0 TEST METHOD

3.1 Measure the background radiation in the area where the personnel radiation monitors will be located.

3.2 Perform vendor supplied startup checks and calibrations for all personnel radiation monitors.

3.3 Measure the response of the personnel radiation monitors to the test source.

4.0 DATA REQUIRED

4.1 Completed vendor specified personnel radiation monitor startup procedures.

14.02-100

5.0 ACCEPTANCE CRITERIA

5.1 The personnel radiation monitors meet design requirements for preventing the release of radioactive materials via personnel egress to the following:

5.1.1 Offsite.

5.1.2 Clean areas onsite.

5.2 The personnel radiation monitors checkout and calibration procedures meet design requirements.

14.2.12.12 I&C Functions

14.2.12.12.1 Accident Monitoring (Test # 138)

Note: The Accident Monitoring is not a separate system but is a collection of functions provided by other systems.

1.0 OBJECTIVE

1.1 To verify proper operation of the postaccident and severe accident systems, which comprise the accident monitoring system. The systems that are used for accident monitoring consist of radiation monitoring, reactor vessel water level indicating system, and selected instrumentation.

1.2 To verify that the accident monitoring system monitors the established parameters.

1.3 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the systems that provide the accident monitoring functions are complete.

2.2 Required special test equipment is available and functional.

2.3 Verify that factory acceptance testing has been completed.

2.4 Verify proper operation of alarm, control, and indication functions.

2.5 Verify preoperational Test #143 has been satisfactorily completed for radiation monitoring instrumentation.

3.0 TEST METHOD

3.1 Simulate data that is indicative of normal and abnormal accident data.

3.2 Verify that accident monitoring systems alert and alarm setpoints have been defined.

3.3 Verify that various displays meet system requirements.

2.4 Verify proper operation of alarm, control and indication functions.

2.5 The reactor trip breakers and associate support systems required to position the partial trip RCCAs are functional.

2.6 Partial trip setpoints have been installed in the RCSL software.

3.0 TEST METHOD

3.1 Simulate signals to plant control system that are equivalent to hot full power.

3.2 Simulate loss of single RCP input to the ~~RPT~~partial trip; observe response.

3.3 Simulate loss of feedwater pump without startup of standby feedwater pump input to the ~~RPT~~partial trip; observe response.

3.4 ~~Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function~~Observe response of turbine controls to partial trip signal.

4.0 DATA REQUIRED

4.1 Input signal values.

4.2 ~~RPCS output response~~Response time from injection of signal to partial trip RCCAs on bottom.

5.0 ACCEPTANCE CRITERIA

~~5.1 The reactor partial trip setpoints have been properly configured in the RCSL software.~~

5.1 The ~~reactor~~ partial trip function sends the signal to drop the designated RCCAs upon receiving the appropriate simulated signal.

5.2 The ~~reactor~~ partial trip function sends the signal to runback the turbine load upon receiving the appropriate simulated signal.

~~5.3 Verify that safety-related components meet electrical independence and redundancy requirements.~~

5.3 The ~~reactor~~ partial trip functions as described in ~~Sections 7.1.1 and 7.7.2~~Section 7.7.2.3.1.

14.2.12.12.5 Primary Depressurization System (Test #151)

1.0 OBJECTIVE

1.1 To verify the flow paths of the primary depressurization system.

1.2 To verify that pressurizer safety valves and associated piping perform as designed.

1.3 To verify that pressurizer severe accident valves and associated piping perform as designed

1.4 To verify the proper operation of the reactor coolant gas vent system and the associated piping.

1.5 To demonstrate electrical independence and redundancy of safety-related power supplies.

2.0 PREREQUISITES

2.1 Construction activities on the system to be tested are essentially complete.

2.2 Plant is at hot zero power (HZP) (pressure and temperature) conditions during HFT.

2.3 Plant systems required to support testing are functional, or temporary systems are installed and functional.

2.4 Permanently installed instrumentation is functional and calibrated, and is functional for performance of the following test.

3.0 TEST METHOD

3.1 Verify the performance of the pressurizer safety valves from the pressurizer to the pressurizer relief tank (PRT) by simulating an over pressurizer condition. To simulate an overpressure condition, a test device is used to apply the required differential pressure between the normal operating pressure and the lift setpoint.

14.02-121 →

3.1.1 Record the response time from initiation of simulated RCS overpressure condition to valve opening time.

3.1.2 Record the reset pressure when the valve shuts.

3.2 Verify the performance of the pressurizer severe accident valves from the pressurizer to the PRT by simulating an over pressurizer condition.

3.3 Verify that the reactor coolant gas vent system (both the pressurizer vent and the reactor vessel upper head vent) meets design depressurization rates.

3.4 Verify flow paths through the rapid depressurization system from the pressurizer to the PRT during valve discharge at HZP fluid conditions.

3.5 Verify pressurizer safety relief and reactor coolant gas vent valves fail to the closed position upon loss of motive power.

3.6 Verify pressurizer severe accident valves fail-as-is upon loss of motive power.

3.7 Check electrical independence and redundancy of power supplies for safety-related functions by selectively removing power and determining loss of function.

3.2 Balance the containment pit cooling system as required to maintain the coil temperatures within the specified limits.

3.3 Verify that the cabling between the reactor bulkhead and the CRDM cabinets has been connected.

3.4 Energize each CRDM.

3.5 Measure the DC voltage across the upper gripper coil and across the shunt on the CRDM.

3.6 Operate each CRDM a minimum of 24 steps and observe rod demand count operation.

3.7 Demonstrate that rod withdrawal block functions in accordance with design requirements.

4.0 DATA REQUIRED

4.1 CRDM cold coil resistance.

4.2 CRDM cable resistance.

4.3 RCS temperature and pressure.

4.4 CRDM coil loop resistance at specified RCS temperature and pressure.

4.5 DC voltage across the upper gripper coil at the specified RCS temperature and pressure.

4.6 DC voltage across the shunt.

4.7 CRDM rod demand digital position readings.

5.0 ACCEPTANCE CRITERIA

5.1 The CRDM system meets design requirements (refer to Sections 4.5 and 4.6).

14.2.12.13.10 Pre-Core Reactor Coolant System Flow Model Verification (Test #170)

14.02-101

Note: It is not possible to measure RCS flow prior to operating at a core power that allows measurement of calorimetric power. The RCS ~~elbow tap~~ flow transmitters will be normalized to 100 percent but this activity will have to be repeated after fuel loading. This is because the core provides a significant portion of the resistance to RCS flow during normal operation that may not match the resistance during hot functional testing.

1.0 OBJECTIVE

1.1 To predict the pre-core RCS flow rate.

1.2 To establish baseline RCS pressure drops.

1.3 To collect RCP coastdown data.

2.0 PREREQUISITES

2.1 Permanently installed instrumentation has been calibrated and is functional.

2.2 Test instrumentation has been checked and calibrated.

2.3 Reactor vessel internals have been installed with full flow debris filters, dummy fuel assemblies, or equivalent that approximates the pressure drop across the core.

2.4 RCS operating at nominal HZP (pressure and temperature) conditions.

2.5 Desired RCPs are operating.

2.6 The associated digital DPS(s) are in operation.

3.0 TEST METHOD

3.1 The RCS ~~elbow tap~~ flow instrumentation has been normalized to 100 percent RCS flow.

3.2 RCS flow, pressure drops, and the data necessary to calculate RCS flows for four RCP operations shall be obtained for various RCP configurations.

14.02-101

3.3 Measure RCP coastdown data for each RCP during a simultaneous four-pump coastdown.

3.3.1 Table 14.3-1 Item 1-6.

3.4 Verify that each RCP doesn't rotate in the reverse direction when other RCPs are operating.

3.5 Verify that operating restrictions for RCP restart are followed.

4.0 DATA REQUIRED

4.1 Steam generator differential pressure.

4.2 RCP differential pressure.

4.3 RCS ~~elbow tap~~ flow indication.

4.4 RCS temperature and pressures at practical locations.

4.5 RCP speed (rpm).

4.6 Reactor vessel differential pressure.

4.7 Operating RCP configuration corresponding to data set.

5.0 ACCEPTANCE CRITERIA

5.1 The predicted RCS flow exceeds the value necessary to establish that post-core flow is in excess of that used for analysis in Chapter 15 and Section 5.0.

5.2 The predicted RCS flow is less than the design maximum flow rate (refer to Section 5.1).

3.1.5 Seal water control valve.

14.02-101 3.1.6 ~~Charging flow control valve.~~Letdown flow control valve.

4.0 DATA REQUIRED

4.1 Letdown temperature, pressure and flow rates.

4.2 Charging temperature and flow rates.

4.3 Charging pump parameters (i.e., motor power, vibration levels, bearing temperatures).

4.4 Differential pressure across specified components.

4.5 VCT pressure and level.

4.6 Pressurizer level.

4.7 RCS temperature and pressure.

4.8 Regenerative heat exchanger inlet and outlet temperatures:

4.8.1 Shell side.

4.8.2 Tube side.

4.9 High pressure cooler inlet and outlet temperatures:

4.9.1 Shell side.

4.9.2 Tube side.

5.0 ACCEPTANCE CRITERIA

5.1 The CVCS meets design requirements (refer to Section 9.3.4).

14.2.12.13.14 Pre-Core Turbine Overspeed (Test #174)

1.0 OBJECTIVE

1.1 (Deleted)

1.2 To demonstrate that the primary and secondary overspeed trip systems protect the turbine as designed.

1.3 To demonstrate electrical independence and redundancy of non-safety-related power supplies.

2.0 PREREQUISITES

2.1 Associated instrumentation has been checked, calibrated, and is functioning satisfactorily prior to performing the test.

2.2 RCS at HZP (temperature and pressure) conditions with the corresponding RCS pressure and temperature conditions.

2.3 Turbine is operating at normal speed but not synchronized to the grid.

2.0 PREREQUISITES

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2.1 BAST is filled to a suitable level with borated water.

2.2 The reactor boron and water makeup system (RBWMS) (i.e., boron addition system) is functional.

2.3 The boron measurement system is functional.

2.4 RCS and CVCS boron concentration is approximately zero (0 ppmB).

3.0 TEST METHOD

3.1 Line up the boric acid pumps to take suction from the BAST and discharge to the charging pump suction and to the RCS, and observe operation of the RBWMS.

3.2 Perform boration and dilution operation of the RCS by operating the boric acid makeup control system in its various modes of operation.

3.3 Sample the RCS during boration and dilution operations and observe operation of the boron measurement system.

4.0 DATA REQUIRED

4.1 RCS temperature and pressure.

4.2 Makeup controller flow readings and setpoints.

4.3 Chemical analysis of boron concentration.

4.4 VCT level.

4.5 Boron measurement system readings.

4.6 Charging flow rates.

4.7 Letdown flow rate.

5.0 ACCEPTANCE CRITERIA

5.1 The RBWMS perform as designed (refer to Section 9.3.4).

14.2.12.13.17 Pre-Core Safety Injection Initiated at HZP (Test #177)

1.0 OBJECTIVE

1.1 To demonstrate the ability of the SI system to inject into a pressurized RCS.

2.0 PREREQUISITES

2.1 The RCS is at HZP (pressure and temperature) conditions.

2.2 The normal RCP trip function on SI injection has been disabled. With no decay heat, the RCS could cool uncontrollably.

3.0 TEST METHOD

3.1 Place the valves in the normal operating position, and maintain plant in as close to normal conditions as it practicable and verify proper operation of the following components:

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3.1.1 Compressors.

3.1.2 Aftercoolers.

3.1.3 Oil separator units, if applicable.

3.1.4 Air receivers.

3.1.5 Dryers including a full regeneration cycle, if applicable.

3.1.6 Pressure controls and compressor unloaders.

3.1.7 Pressure reducing stations.

3.1.8 Automatic and manual start / stop circuits of standby compressors.

3.1.9 Controls to change operating sequence of units (spread operating time and starting duty).

3.1.10 High and low pressure alarms.

3.1.11 Pressure indicators.

3.1.12 Temperature indicators.

3.1.13 Safety and relief valve settings.

3.1.14 Bypass valve operation.

3.1.15 Differential pressure switches.

3.2 Where safe to personnel and equipment, conduct a loss of air test on integrated systems by performing the following tests:

3.2.1 Shutoff the instrument air system in a manner that would simulate a sudden air pipe break and verify that the affected components respond as designed.

3.2.2 Repeat Test A, but shut the instrument air system off slowly to simulate a gradual loss of pressure.

3.2.3 Where deemed necessary, depressurize individual components. Note component response.

3.2.4 Return instrument air to the depressurized systems and components. Note responses.

3.2.5 Verify automatic isolations between safety and non-safety or between plant critical and plant non-critical components function as designed.

3.2.6 Simulate worse case loads by simultaneous operation of components or by creating a false parasitic load that bounds estimates of simultaneous operation of worse case loads.

3.2.7 Verify acceptable operation at the full load capacity.

3.2.8 Verify proper operation of alarms and automatic and manual alarm resets.

4.0 DATA REQUIRED

4.1 Baseline data using the loose parts and vibration monitoring systems.

4.2 Loose parts and vibration monitoring systems alarm setpoints.

4.3 RCS temperature and pressure.

5.0 ACCEPTANCE CRITERIA

5.1 The loose parts and vibration monitoring systems perform as designed (refer to Section 7.1.1).

5.2 The loose parts and vibration monitoring systems alarm setpoints have been adjusted using the baseline data.

14.2.12.14.4 Post-Core RCS Temperature Cross Calibration (Test #182)

1.0 OBJECTIVE

1.1 To normalize the RCS temperature transmitters.

1.2 To measure post-core RCS pressure drops.

2.0 PREREQUISITES

2.1 Construction activities have been completed and the RCS is operational or functional as required by regulatory requirements.

2.2 Permanently installed temperature instrumentation is calibrated and functional or operable, as required.

2.3 The RCS is operating at nominal 350°F conditions with RHR removed from service.

2.4 Test #188 has measured the resistance of the thermocouples.

3.0 TEST METHOD

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3.1 Collect T_{cold} and T_{hot} data from each RCS RTD.

3.2 Collect core exit thermocouple data from each thermocouple located in the core area.

3.3 Slowly increase RCS temperature and collect data at 50°F increments.

3.4 Perform the cross-calibration of the RCS RTDs.

3.5 Verify that the RCS temperature indication meets design requirements for correlation between the various sources.

4.0 DATA REQUIRED

4.1 The following data shall be recorded with a frequent scan rate and time stamped.

4.1.1 RCS T_{cold} data.

3.0 TEST METHOD

3.1 Withdraw and insert each RCCA to verify as designed operation of CRDM.

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3.2 Measure and record at least ~~one to~~ three drop times for each RCCA:

3.2.1 Perform three measurements of rod drop time for each of those RCCAs falling outside the two-sigma limit for similar RCCAs.

3.3 Withdraw and insert each RCCA while recording position indications and alarms.

4.0 DATA REQUIRED

4.1 RCCA drop time.

4.2 RCS temperature and pressure to be taken during measurement and recording of drop time for each RCCA.

4.3 RCCA position and alarm indications.

5.0 ACCEPTANCE CRITERIA

5.1 The CRDM, RCCAs and their associated position indications operate as designed (refer to Section 4.6).

5.2 RCCA drop times are in agreement with the limits specified in accident analyses, with margin or as specified in regulatory documents.

14.2.12.14.7 Post-Core Reactor Coolant and Secondary Water Chemistry Data (Test #185)

1.0 OBJECTIVE

1.1 To maintain the proper water chemistry for the RCS and SGs during post-core heatup.

2.0 PREREQUISITES

2.1 Primary and secondary sampling systems are functional.

2.2 Primary and secondary chemical addition systems are functional.

2.3 The coolant purification ion exchangers are charged with resin.

2.4 The SG blowdown demineralizing ion exchangers are charged with resin.

2.5 Chemicals to support cleanup are available.

3.0 TEST METHOD

3.1 Perform sampling frequency for the SG and RCS as specified by the AREVA chemistry specifications. The sampling frequency shall be modified as required to make sure the as-designed RCS and SG water chemistry.

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2.3 The reactor is at 350°F conditions.

3.0 TEST METHOD

3.1 Measure and record the leakage resistance of each incore detector. This step can be performed at a lower RCS temperature than 350°F but the test can not be completed until the various temperature indications are compared at 350°F.

3.2 Verify that the core exit thermocouples indicate a temperature that corresponds to 350°F.

3.3 Increase RCS temperature by 50°F and collect corresponding thermocouple and RTD data.

3.4 Repeat data collection until RCS temperature is ≥568°F.

4.0 DATA REQUIRED

4.1 RCS temperature and pressure.

4.2 Leakage resistance measurements.

4.3 Plant monitoring system readout.

5.0 ACCEPTANCE CRITERIA

5.1 Leakage resistance of the fixed incore detectors is as described in manufacturer's recommendations.

5.2 The calibration of the thermocouples meets the requirements of 10 CFR 50.34(f)(2)(viii).

14.2.12.14.11 Leak Detection Systems (Test #189)

1.0 OBJECTIVE

1.1 To obtain baseline data on the LDS.

1.2 To adjust leak detection alarm setpoints as necessary to reflect actual plant operational conditions.

2.0 PREREQUISITES

2.1 Preoperational test (Test #137) on the LDS has been completed.

2.2 The leak detection instrumentation has been calibrated and is functional.

3.0 TEST METHOD

3.1 Collect baseline data using the LDS during plant heatup and at normal operation.

data has been taken that shall demonstrate the plant's ability to meet unit load swing design transients as designed (refer to Sections 3.9.1.1, 4.4.3.4, and 7.7.1.1).

5.2 That no audible noise or significant vibration is observed in the SG or in the rest of the feedwater and EFWS due to water hammer.

14.2.12.18.2 Secondary Calorimetric Power (Test #201)

1.0 OBJECTIVE

1.1 To verify that various indications of core power have been calibrated to the calculated calorimetric power produced by the secondary systems.

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1.2 ~~To determine~~ The secondary calorimetric power and associated calibrations shall be performed prior to determining the core power distributions using incore instrumentation. This procedure shall be repeated at the following plateaus:

1.2.1 25 percent reactor power in accordance with RG 1.68.

1.2.2 50 percent reactor power in accordance with RG 1.68.

1.2.3 75 percent reactor power in accordance with RG 1.68.

1.2.4 ≥98 percent reactor power in accordance with RG 1.68.

2.0 PREREQUISITES

2.1 The reactor is operating at the desired power.

2.2 The data required for calculating secondary calorimetric power is available.

3.0 TEST METHOD

3.1 Maintain reactor power, T_{avg}, and pressurizer level constant during data collection.

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3.2 Compare ~~reactor~~secondary calorimetric power to power calculated by independent sources (e.g., ~~delta temperature~~reactor enthalpy power, first stage steam pressure, excore nuclear instrumentation) and recalibrate as necessary to maintain acceptable disagreement between secondary calorimetric power and independent power indication sources.

4.0 DATA REQUIRED

4.1 Reactor power indicated by various sources.

5.0 ACCEPTANCE CRITERIA

5.1 The various reactor power indications have been calibrated to agree with the calculated secondary calorimetric power.

4.0 DATA REQUIRED

4.1 Reactor power.

4.2 RCS and secondary temperature.

4.3 Boron concentration and boron-10 isotopic abundance.

4.4 Core average burnup.

4.5 Isotopic activities.

5.0 ACCEPTANCE CRITERIA

5.1 Measured activity levels are within their limits.

5.2 Laboratory analyses and process radiation monitors agree with the within measurement uncertainties as designed (refer to Section 9.3.2 or investigation of the discrepancies has been initiated.

5.3 Samples of RCS and secondary fluids can be obtained from design locations as designed (refer to Section 9.3.2).

14.2.12.18.7 Self Powered Neutron Detector Calibration (Test #206)

1.0 OBJECTIVE

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1.1 ~~To perform a full core flux map using the movable incore detector (i.e., AMS).~~ To perform a full core flux map using the following:

1.1.1 Moveable incore system - Aeroball measurement system (AMS).

1.1.2 Fixed incore system - Self powered neutron detectors (SPND).

1.2 Normalize the fixed incore detector system (SPND) to the ~~AMS~~ (~~using~~full core flux map produced by the POWERTRAX system) at the following power plateaus:

1.2.1 25 percent reactor power.

1.2.2 50 percent reactor power.

1.2.3 75 percent reactor power.

1.2.4 ≥98 percent reactor power.

2.0 PREREQUISITES

2.1 The reactor is at the specified power level and equilibrium xenon conditions.

2.2 The incore detector systems, related digital processing computers, and POWERTRAX are operable.

3.0 TEST METHOD

3.1 Movable incore (i.e., AMS) signals are measured.

3.2 Full core flux map is processed.

3.3 Normalization of fixed incore system is performed by POWERTRAX.

3.4 Background detector signals are recorded.

4.0 DATA REQUIRED

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4.1 Reactor power as indicated by the secondary calorimetric.

4.2 Reactor power as indicated by the primary enthalpy calorimetric.

4.3 RCCA position.

4.4 Boron concentration and boron-10 isotopic abundance.

4.5 Incore detector system data.

5.0 ACCEPTANCE CRITERIA

5.1 The full core flux map data is available for determining SPND calibration constants from measured core power distributions, using POWERTRAX.

14.2.12.18.8 Steady-State Core Performance (Test #207)

1.0 OBJECTIVE

1.1 To demonstrate that the core has been assembled as designed.

1.2 To determine if the measured and predicted power distributions are consistent. This test indirectly confirms that the predicted reactivity coefficients are within design assumptions.

1.3 To perform calibrations of fixed incore and excore instrumentation based on a full core flux map performed with the movable incore flux mapping (i.e., Aeroball) system.

1.4 To determine core power distributions using the movable incore instrumentation. This procedure shall be repeated at the following plateaus:

1.4.1 25 percent reactor power in accordance with RG 1.68.

1.4.2 50 percent reactor power in accordance with RG 1.68.

1.4.3 75 percent reactor power in accordance with RG 1.68.

1.4.4 ≥98 percent reactor power in accordance with RG 1.68.

2.0 PREREQUISITES

2.1 The reactor is operating at the desired power level and the RCCA configuration is within the suggested limits proposed by the core designer.

2.2 The following data is available for updating the three dimensional nodal model (POWERTRAX):

2.2.1 Core power history.

14.2.12.20.3 Loss of Feedwater Pump (Test #217)

1.0 OBJECTIVE

1.1 To evaluate system response to a loss of one of three operating feedwater pumps.

14.02-101 → ~~1.2 To demonstrate system effectiveness of instrumentation in detecting a dropped rod and verification of automatic actions in accordance with RG 1.68.~~

1.2 To demonstrate that rapid load changes can be accomplished in a manner that maintains plant safety.

1.3 This procedure shall be performed at the following plateau:

1.3.1 75 percent reactor power.

2.0 PREREQUISITES

2.1 The reactor is operating at the desired power level.

2.2 Establish a band of operation in which there are no restrictions on the rate of load increase or decrease based on AREVA Fuel Preconditioning Guidelines.

2.3 The following systems are in automatic operation:

2.3.1 Primary and secondary level controls (e.g., pressurizer, feedwater heaters, VCT, deaerator, SG).

2.3.2 Primary and secondary pressure controls (e.g., pressurizer, VCT, condensate).

2.3.3 Primary and secondary flow controls (e.g., CVCS letdown, feedwater).

2.3.4 Primary and secondary temperature controls (e.g., RCS T_{avg}).

2.3.5 Rod control (the rod pilot system is operating in automatic with no RCCA movement prior (20 minutes) to the test).

2.4 Verify that each feedwater pump is providing approximately 33 percent of the required feedwater flow.

3.0 TEST METHOD

3.1 Loss of main feedwater pump:

3.1.1 One of the three operating feedwater pumps is tripped.

3.1.2 Standby feedwater pump starts or partial trip occurs.

3.2 RCCA Drop:

3.2.1 If standby feedwater pumps fail to start, verify that a partial reactor trip occurred in response to the change in feedwater flow.

3.3 Verify that response to loss of feedwater is as designed.

**Table 14.2-1—List of Initial Tests for the U.S. EPR
Sheet 3 of 14**

Test #	Test Name	FSAR or COLA Test	Applicable Section of RG 1.68, Revision 3	Other RG	ITAAC
037	Pressurizer Safety Relief Valves 14.02-121	FSAR	Appendix A, 1.a.(2)(d) & 5.t		
038	Fuel Handling System	FSAR	Appendix A, 1.m.(2)		
039	Fuel Transfer System Operation and Leak Test	FSAR	Appendix A, 1.m.(3) & (5)		
040	Containment Polar Crane	FSAR	Appendix A, 1.o.(1), (2), & (3)	NUREG-0554 NUREG-0612 ASME NOG-1	
041	Fuel Building Cranes	FSAR	Appendix A, 1.m.(2)	NURGE-0554 NUREG-0612 ASME-NOG1	
042	Turbine Building Crane	FSAR	Appendix A, 1.n		
043	Raw Water Supply System	COLA	Appendix A, 1.n		
044	Reserved				
045	Seal Water Supply System	FSAR	Appendix A, 1.n.(8)		
046	Component Cooling Water System	FSAR	Appendix A, 1.d.(11) & 1.n.(3)		
047	Reserved				
048	Essential Service Water System	FSAR	Appendix A, 1.d.(11) & 1.n.(1)		
049	Ultimate Heat Sink	FSAR	Appendix A, 1.d.(10) & 1.h.(10)		
050	Reserved				
051	Reserved				

Table 14.2-1—List of Initial Tests for the U.S. EPR
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Test #	Test Name	FSAR or COLA Test	Applicable Section of RG 1.68, Revision 3	Other RG	ITAAC
052	Safety Chilled Water System	FSAR	Appendix A, 1.n.(14)		
053	Reserved				
054	Fire Water Distribution System	FSAR	Appendix A, 1.n.(7)		
055	Spray Deluge System	FSAR	Appendix A, 1.n.(7)		
056	Sprinkler System	FSAR	Appendix A, 1.n.(7)		
057	Gaseous Fire Extinguishing System	FSAR	Appendix A, 1.n.(7)		
058	Reserved				
059	Feedwater System	FSAR	Appendix A, 1.e.(9)		
060	Feedwater Heating System	FSAR	Appendix A, 1.e.(10)		
061	Main Steam – Turbine Bypass Systems	FSAR	Appendix A, 1.e.(2) & 5.t		
062	Main Steam Safety Valve	FSAR	Appendix A, 1.d.(1), ~~&~~ 1.e.(4) & 5.t		
063	Main Steam Isolation Valves and MSIV Bypass Valves	FSAR	Appendix A, 1.d.(7), 1.e.(3), & 5.u		
064	Turbine Gland Sealing System	FSAR	Appendix A, 1.e.(5)		
065	Main Condenser and Main Condenser Evacuation System	FSAR	Appendix A, 1.e.(7)		
066	Condensate System	FSAR	Appendix A, 1.e.(8)		
067	Steam Generator Blowdown System	FSAR	Appendix A, 1.e.(1)		
068	Steam Turbine	FSAR	Appendix A, 1.e.(6) & 5.t		

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Table 14.2-1—List of Initial Tests for the U.S. EPR
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Test #	Test Name	FSAR or COLA Test	Applicable Section of RG 1.68, Revision 3	Other RG	ITAAC
085	Smoke Confinement System	FSAR	Appendix A, 1.n.(14)		
086	Switchgear Building Ventilation System	FSAR	Appendix A, 1.n.(14)		
087	Turbine Island Ventilation Systems	FSAR	Appendix A, 1.n.(14)		
088	Essential Service Water Pump Building Ventilation System	FSAR	Appendix A, 1.n.(14)		
089	Reserved				
090	~~Reserved~~Plant Laboratory Equipment	COLA	Appendix A, 1.k		
091	Leak-off System	FSAR	Appendix A, 1.n		
092	Sampling Activity Monitoring System	FSAR	Appendix A, 1.k.(1)		
093	Solid Waste Storage System	FSAR	Appendix A, 1.l.(3)		
094	Radioactive Concentrates Processing System – Solid Waste	FSAR	Appendix A, 1.l.(3)		
095	Liquid Waste Processing System	FSAR	Appendix A, 1.l.(1)		
096	Reactor Coolant Drain Tank	FSAR	Appendix A, 1.l.(7)		
097	~~Equipment~~Process Drain Tank	FSAR	Appendix A, 1.l.(7)		
098	Equipment and Floor Drainage System	FSAR	Appendix A, 1.l.(7)		
099	Gaseous Waste Processing System	FSAR	Appendix A, 1.l.(2)		
100	Nuclear Sampling System	FSAR	Appendix A, 1.l.(8)		
101	Station Blackout Diesel Generator ~~Set~~Mechanical	FSAR	Appendix A, 1.g.(1)		
102	Station Blackout Diesel Generator Electrical	FSAR	Appendix A, 1.g.(1)		

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Table 14.2-1—List of Initial Tests for the U.S. EPR
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Test #	Test Name	FSAR or COLA Test	Applicable Section of RG 1.68, Revision 3	Other RG	ITAAC
103	Station Blackout Diesel Generator Auxiliaries	FSAR	Appendix A, 1.g.(1)		
104	Emergency Diesel Generator SetMechanical	FSAR	Appendix A, 1.g.(3)	RG 1.9	
105	Emergency Diesel Generator Electrical	FSAR	Appendix A, 1.g.(3)	RG 1.9	
106	Emergency Diesel Generator Auxiliaries	FSAR	Appendix A, 1.g.(3)	RG 1.9	
107	Auxiliary Steam Generating System	FSAR	Appendix A, 1.n.		
108	Switchyard and Preferred Power System	FSAR	Appendix A, 1.g.(1)		
109	Unit Main Power SystemMain Generator	FSAR	Appendix A, 1.g.(1)		
110	Class 1E Uninterruptible Power Supply	FSAR	Appendix A, 1.g.(3)		
111	Non-Class 1E Uninterruptible Power Supply	FSAR	Appendix A, 1.g.(1)		
112	Control Rod Drive Power System	FSAR	Appendix A, 1.g.(1)		
113	Normal Lighting System	FSAR	Appendix A, 1.g.(1)		
114	ReservedHeat Tracing	FSAR	Appendix, A, 1.n.(1b)		
115	Emergency Lighting System	FSAR	Appendix A, 1.g.(1)		
116	6.9 Kv Class IE Emergency Power System Supply	FSAR	Appendix A, 1.g.(2)		
117	480 V Class IE Emergency Power System Supply	FSAR	Appendix A, 1.g.(2)		
118	13.8 Kv Class IE Normal Power System Supply	FSAR	Appendix A, 1.g.(1)		
119	6.9 Kv Normal Power System Supply	FSAR	Appendix A, 1.g.(1)		
120	480 V Normal Power System Supply	FSAR	Appendix A, 1.g.(1)		

Table 14.2-1—List of Initial Tests for the U.S. EPR
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Test #	Test Name	FSAR or COLA Test	Applicable Section of RG 1.68, Revision 3	Other RG	ITAAC
139	~~Reserved~~ Safety Automation System	FSAR	Appendix A, 1.c.		
140	Remote Shutdown Station	FSAR	Appendix A, 1.j.(19)	RG 1.68.2	
141	Incore Instrumentation System	FSAR	Appendix A, 1.j.(13)		
142	Excore Instrumentation System	FSAR	Appendix A, 1.j.(13)		
143	Radiation Monitoring System	FSAR	Appendix A, 1.k.(1)		
144	Process and Effluent Radiological Monitoring System	FSAR	Appendix A, 1.k.(1)		
145	Hydrogen Monitoring System	FSAR	Appendix A, 1.j.(23)		
146	Protection System	FSAR	Appendix A, 1.c.		
147	Reactor Control, Surveillance ~~&~~ and Limitation System	FSAR	Appendix A, 1.j.(8)		
148	Main Steam Relief Trains	FSAR	Appendix A, 1.d.(3), ~~&~~ 1.e.(4) & 5.t		
149	Steam Generator Level Control	FSAR	Appendix A, 1.j.(2)		
150	~~Reactor~~ Partial Trip	FSAR	Appendix A, 1.c.		
151	Primary Depressurization	FSAR	Appendix A, 1.a.(2)(d), ~~&~~ 1.h.(2) & 5.t		
152	Partial Cooldown	FSAR	Appendix A, 1.a.(2)(d) & 1.h.(2)		
153	Integrity of Systems Likely to Contain Radioactive Material	FSAR	Appendix A, 5.cc	NUREG-0578, 0660, and 0664	
154	Remote Safe Shutdown	FSAR	Appendix A, 1.c		

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Table 14.3-8—ITAAC Screening Summary
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Structure, System, or Component	System KKS Code(s)	Within Scope of Tier 1	Has ITAAC in Tier 1	Tier 1 Section
Auxiliary Systems				
Emergency Diesel Generator	XJA, XKA, XJN, XJV, XJG, XJQ, XJR, XJX, ~~CXN~~	X	X	2.5.4
Gaseous Waste Management System	KPL	X		2.9.3
Leak-off System	JMM	X		2.7.7
Liquid Waste Management System	KPK, KPF	X		2.9.1
Nuclear Island Drain and Vent Systems	KT	X	X	2.9.5
Nuclear Sampling System	KU	X		2.9.6
Sampling Activity Monitoring Systems	KLK	X	X	2.9.4
Severe Accident Sampling System	KUL	X		2.3.4
Solid Waste Management System	KPC	X		2.9.2
Station Blackout Alternate AC Source	XJA, XKA, XJN, XJV, XJG, XJQ, XJR, XJX, ~~CXN~~	X	X	2.5.3
Electrical Systems				
12-Hour Uninterruptible Power Supply System	BRB, BRV, BRW, BRX, BUV, BUX, BRC, BRV03, BTB, BTM, BUD, BUE	X	X	2.5.11
Class 1E Uninterruptible Power Supply	BRA, BRU01, BRW, BTD, BTP, BUC, BUW, BGA	X	X	2.5.2
Class 1E Emergency Power Supply System	BD, BM, BN	X	X	2.5.1
Lighting System	BG, BJ, BL, BZL	X	X	2.5.9
Lightning Protection and Grounding	BAW	X	X	2.5.8

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Table 1.3-1—Abbreviations and Acronyms List (6 Sheets)

14.03.03-44

Term	Definition
1/2 EPGB	Divisions 1 and 2 Emergency Power Generating Building
3/4 EPGB	Divisions 3 and 4 Emergency Power Generating Building
10CFR	Title 10, Code of Federal Regulations
12UPS	12-Hour Uninterruptible Power Supply System
AAC	Alternate AC Source
AC or ac	Alternating Current
ALU	Actuation Logic Unit
AMI	Accident Monitoring Instrumentation
AOO	Anticipated Operational Occurrence
ASME	American Society of Mechanical Engineers
ATWS	Anticipated Transient Without Scram
AVS	Annulus Ventilation System
AWG	American Wire Gauge
BCMS	Boron Concentration Measurement System
BDBE	Beyond Design Basis Event
BPV	Boiler and Pressure Vessel
BTU	British Thermal Unit
CAV	Cumulative Absolute Velocity
CBVS	Containment Building Ventilation System
CCWS	Component Cooling Water System
CGCS	Combustible Gas Control System
CIS	Containment Isolation Signal
CL	Cold Leg
CMSS	Core Melt Stabilization System
COL	Combined License
COMS	Communication System
CRACS	Control Room Air Conditioning System
CRDCS	Control Rod Drive Control System
CRDM	Control Rod Drive Mechanism
CRE	Control Room Envelope
CVCS	Chemical and Volume Control System
DAC	Design Acceptance Criteria
DAS	Diverse Actuation System
DBA	Design Basis Accident

Table 2.4.7-1—Seismic Monitoring System ITAAC

14.03.03-41

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
2.1	The location of the SMS equipment is as described in Section 2.1.	a. Analyses will be performed to determine the location of the SMS equipment., and inspections will be performed of the location of the SMS equipment. b. Inspections will be performed to verify the location of the SMS equipment is per the analyses.	The SMS equipment is located as per the analyses. a. An analysis report exists that determines the location of the SMS equipment. b. The SMS equipment is located as per the analyses.
3.1	The SMS system can compute the CAV and provides a display of the CAV in the MCR.	a. Type tests, tests, analyses, or a combination of analyses and tests will be performed on the SMS. b. Inspections will be performed for the existence or retrieve-ability of a display of CAV in the MCR.	a. The SMS can compute the CAV. b. Indication and alarms from CAV can be retrieved in the MCR.
3.2	The SMS has sufficient dynamic range.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has a dynamic range of at least 1000:1 zero-to-peak and is able to record at least 1.0 g zero-to-peak.
3.3	The SMS has sufficient bandwidth.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has bandwidth of at least 0.2 to 50 Hertz.
3.4	The SMS has a sufficient sampling rate.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has a sample rate of at least 200 samples per second in each of the three directions.
3.5	The SMS has a sufficient trigger rate.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has an actuating level that is adjustable and within the range of 0.001g and 0.02g.
4.1	The SMS backup battery has sufficient capacity to power its instruments for continuous operation for a period of time.	Type tests, analyses or a combination of type tests and analyses of the SMS equipment will be performed.	The SMS has a backup battery that has a capacity for a minimum of 25 minutes of system operation.

Table 2.5.1-3—Class 1E Emergency Power Supply System ITAAC (6 Sheets)

14.03.03-42

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.11	EPSS switchgear, load centers, MCCs, and transformers as listed in Table 2.5.1-2 and their feeder breakers and load breakers are sized to supply their load requirements.	a. An analysis will be performed. b. An inspection will be performed.	a. The EPSS switchgear, load centers, MCCs, and transformers as listed in Table 2.5.1-2 and their feeder breakers and load breaker ratings are greater than their analyzed load requirements. b. The ratings of the installed EPSS switchgear, load centers, MCCs, and transformers as listed in Table 2.5.1-2 and their feeder breakers and load breakers meet the analysis criteria.
5.12	EPSS cables and buses are sized to supply their assigned load requirements.	a. An analysis will be performed. b. An inspection will be performed.	a. The ~~as-built~~ EPSS cables and buses are sized to supply their analyzed load requirements. b. The ratings of the installed EPSS cables and buses meet the analysis criteria.
5.13	EPSS interrupting devices (e.g., circuit breakers and fuses) are coordinated so that the circuit interrupting device closest to the fault is designed to open before other devices.	a. An analysis will be performed. b. An inspection will be performed.	a. EPSS interrupting devices (e.g., circuit breakers and fuses) are coordinated so that the circuit interrupting device closest to the fault is designed to open before other devices. b. The ratings of the installed EPSS interrupting devices (e.g., circuit breakers and fuses) meet the analysis criteria.

Table 2.5.1-3—Class 1E Emergency Power Supply System ITAAC (6 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
5.14	EPSS switchgear, load centers, MCCs, and transformers listed in Table 2.5.1-2 are rated to withstand fault currents for the time required to clear the fault from its power source. 14.03.03-42	a. An analysis will be performed. b. An inspection will be performed.	a. The current capability of the EPSS switchgear, load centers, MCCs, and transformers as listed in Table 2.5.1-2 are greater than the analyzed fault currents for the time required to clear the fault from its power source as determined by circuit interrupting device coordination analysis. b. The ratings of the installed EPSS switchgear, load centers, MCCs, and transformers as listed in Table 2.5.1-2 meet the analysis criteria.
5.15	The feeder and load circuit breakers for EPSS switchgear, load centers and MCCs are rated to interrupt fault currents.	a. An analysis will be performed. b. An inspection will be performed.	a. The current interrupting capability of the feeder and load circuit breakers for the EPSS switchgear, load centers and MCCs are greater than the analyzed fault currents. b. The ratings of the installed EPSS switchgear, load centers, MCCs feeder and load circuit breakers meet the analysis criteria.
6.1	Each EPSS division has an assigned EDG that provides power if there is a loss of offsite power.	Tests will be performed.	Each EPSS division has an assigned EDG that provides power if there is a loss of offsite power.
6.2	Each EPSS 6.9 kV switchgear offsite power supply circuit breaker is opened by a protection system LOOP signal.	Tests will be performed.	Each EPSS division automatically separates from the offsite power supply on a signal from the protection system.

Table 2.5.2-3—Class 1E Uninterruptible Power Supply ITAAC (5 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
5.10	EUPS switchboards, MCCs, transformers, panelboards, and converters as listed in Table 2.5.2-2 and their feeder breakers and load breakers are sized to supply their load requirements. 14.03.03-42	a. An analysis will be performed. b. An inspection will be performed.	a. The EUPS switchboards, MCCs, transformers, panelboards, and converters as listed in Table 2.5.2-2 and their feeder breakers and load breakers are sized to supply their analyzed load requirements. b. The ratings of the installed EUPS switchboards, MCCs, transformers, panelboards, and converters as listed in Table 2.5.2-2 and their feeder breakers and load breakers meet the analysis criteria.
5.11	EUPS cables and buses are sized to supply their assigned load requirements.	a. An analysis will be performed. b. An inspection will be performed.	a. The ~~as-built~~ EUPS cables and buses are sized to supply their analyzed load requirements. b. The ratings of the installed EUPS cables and buses meet the analysis criteria.
5.12	Each EUPS battery is able to provide power for starting and operating design loads for a minimum of two hours when the ac supply to the battery charger is lost.	a. An analysis will be performed. b. A test will be performed.	a. Analysis concludes the as-built EUPS battery is able to provide power for starting and operating analyzed design loads for a minimum time of two hours while battery terminal voltage remains above minimum voltage required for the design loads. b. The capacity of the as-built EUPS battery is equal to or greater than the analyzed battery design duty cycle.

Table 2.5.2-3—Class 1E Uninterruptible Power Supply ITAAC (5 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.13	Each EUPS battery charger supplies assigned EUPS loads while maintaining the respective EUPS battery charged.	A test will be performed.	Each EUPS battery charger can maintain an output current that can supply the assigned EUPS loads while maintaining the respective EUPS battery charged.
5.14	The EUPS inverters are sized to power the design EUPS loads on the respective supplied MCC. 14.03.03-42	a. An analysis will be performed. b. An inspection will be performed.	a. Analysis concludes each EUPS inverter rating is greater than the analyzed load requirements. b. The ratings of the installed EUPS inverters meet the analysis criteria.
5.15	EUPS operating voltage remains within the terminal voltage range of the supplied safety-related equipment during the battery duty cycle.	An analysis will be performed.	EUPS operating voltage remains within the terminal voltage range of the supplied safety-related equipment during the battery duty cycle.
5.16	EUPS switchboards, MCCs, transformers and panelboards listed in Table 2.5.2-2 are rated to withstand fault currents for the time required to clear the fault from its power source.	a. An analysis will be performed. b. An inspection will be performed.	a. The current capability of the EUPS switchboards, MCCs, transformers and panelboards listed in Table 2.5.2-2 are greater than the analyzed fault currents for the time required to clear the fault from its power source as determined by circuit interrupting device coordination analysis. b. The ratings of the installed EUPS switchboards, MCCs, transformers and panelboards listed in Table 2.5.2-2 meet the analysis criteria.
5.17	The feeder and load circuit breakers for EUPS switchboards, MCCs and panelboards are rated to interrupt fault currents.	a. An analysis will be performed.	a. The current interrupting capability of the feeder and load circuit breakers for the EUPS switchboards, MCCs and panelboards are greater than the analyzed fault currents.

Table 2.5.2-3—Class 1E Uninterruptible Power Supply ITAAC (5 Sheets)

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
	14.03.03-42	b. An inspection will be performed.	b. The ratings of the installed EUPS switchboards, MCC and panelboard feeder and load circuit breakers meet the analysis criteria.
5.18	EUPS interrupting devices (e.g., circuit breakers and fuses) are coordinated so that the circuit interrupting device closest to the fault is designed to open before other devices.	a. An analysis will be performed. b. An inspection will be performed.	a. EUPS interrupting devices (e.g., circuit breakers and fuses) are coordinated so that the circuit interrupting device closest to the fault is designed to open before other devices. b. The ratings of the installed EUPS interrupting device (e.g., circuit breakers and fuses) meet the analysis criteria.
5.19	Harmonic distortion does not prevent safety-related equipment from performing safety functions.	An analysis will be performed.	Analysis of the Class 1E buses concludes that total harmonic distortion does not exceed 5 percent voltage distortion on the Class 1E buses.

Next File

2.5.4 Emergency Diesel Generator

1.0 Description

The emergency diesel generators (EDG) provide a standby source of Class 1E power to safety-related and non-safety-related loads during conditions that result in a loss of preferred power to emergency power supply system (EPSS) buses.

2.0 Arrangement

2.1 The functional arrangement of the EDG fuel oil storage and transfer system is as shown in Figure 2.5.4-1— Emergency Diesel Generator Fuel Oil Storage and Transfer System Functional Arrangement.

2.2 EDGs and their respective support systems are located as listed in Table 2.5.4-1—Emergency Diesel Generator Equipment Mechanical Design.

2.3 Deleted.

2.4 The functional arrangement of the EDG lubricating oil system is as shown in Figure 2.5.4-2—Emergency Diesel Generator Lubricating Oil System Functional Arrangement.

2.5 The functional arrangement of the EDG air intake and exhaust system is as shown in Figure 2.5.4-3—Emergency Diesel Generator Air Intake and Exhaust System Functional Arrangement.

2.6 The functional arrangement of the EDG cooling water system is as shown in Figure 2.5.4-4—Emergency Diesel Generator Cooling Water System Functional Arrangement.

2.7 The functional arrangement of the EDG starting air system is as shown in Figure 2.5.4-5—Emergency Diesel Generator Starting Air System Functional Arrangement.

3.0 Mechanical Design Features, Electrical and Seismic Classifications

3.1 Deleted.~~Equipment listed in Table 2.5.4-1 as ASME Code Section III is designed, welded, and hydrostatically tested in accordance with ASME Code Section III.~~

3.2 Deleted.

3.3 Deleted.

3.4 Deleted.

3.5 Deleted.

3.6 Deleted.

3.7 Components identified as Seismic Category I in Table 2.5.4-1 can withstand seismic design basis loads without a loss of the function listed in Table 2.5.4-1.~~Equipment identified as Seismic Category I in Table 2.5.4-1 can withstand seismic design basis loads without loss of safety function.~~

3.8 Deleted.

3.9 Each EDG has a fuel oil storage tank.

3.10 Each EDG has a fuel oil day tank.

3.11 Each fuel oil transfer pump capacity is greater than EDG fuel oil consumption at the continuous rating.

3.12 Each EDG starting air system is capable of providing air to start the respective EDG without being recharged.

3.13 Check valves listed in Table 2.5.4-1 will function as listed in Table 2.5.4-1.

3.14 Each EDG lubricating oil system provides lubrication to the engine and turbocharger wearing parts during engine operation.

3.15 Each EDG exhaust path has a bypass exhaust path.

3.16 Portions of the EDG piping shown as ASME Code Section III in Figure 2.5.4-1, Figure 2.5.4-2, Figure 2.5.4-3, Figure 2.5.4-4, and Figure 2.5.4-5 are designed in accordance with ASME Code Section III requirements.

3.17 Portions of the EDG piping shown as ASME Code Section III in Figure 2.5.4-1, Figure 2.5.4-2, Figure 2.5.4-3, Figure 2.5.4-4, and Figure 2.5.4-5 are installed in accordance with an ASME Code Section III Design Report.

3.18 Pressure boundary welds in portions of the EDG piping shown as ASME Code Section III in Figure 2.5.4-1, Figure 2.5.4-2, Figure 2.5.4-3, Figure 2.5.4-4, and Figure 2.5.4-5 are in accordance with ASME Code Section III.

3.19 Portions of the EDG piping shown as ASME Code Section III in Figure 2.5.4-1, Figure 2.5.4-2, Figure 2.5.4-3, Figure 2.5.4-4, and Figure 2.5.4-5 retain their pressure boundary integrity at their design pressure.

3.20 Portions of the EDG piping shown as ASME Code Section III in Figure 2.5.4-1, Figure 2.5.4-2, Figure 2.5.4-3, Figure 2.5.4-4, and Figure 2.5.4-5 are installed in accordance with ASME Code Section III requirements.

3.21 Components listed in Table 2.5.4-1 as ASME Code Section III are designed in accordance with ASME Code Section III requirements.

3.22 Components listed in Table 2.5.4-1 as ASME Code Section III are fabricated in accordance with ASME Code Section III requirements.

3.23 Pressure boundary welds on components listed in Table 2.5.4-1 as ASME Code Section III are in accordance with ASME Code Section III requirements.

3.24 Components listed in Table 2.5.4-1 as ASME Code Section III retain their pressure boundary integrity at their design pressure.

4.0 I&C Design Features, Alarms, Displays and Controls

4.1 Displays listed in Table 2.5.4-2 and Table 2.5.4-3 are retrievable in the main control room (MCR) and the remote shutdown station (RSS) as listed in Table 2.5.4-2 and Table 2.5.4-3.

4.2 EDG equipment controls are provided in the MCR and RSS as listed in Table 2.5.4-2 and Table 2.5.4-3.

4.3 Equipment listed as being controlled by a priority and actuator control system (PACS) module in Table 2.5.4-2 responds to the state requested by a test signal.

5.0 Electrical Considerations

5.1 The EDG control power is provided by the EUPS system from the respective division.

5.2 The components identified as Class 1E in Table 2.5.4-2 are powered from the Class 1E division listed in Table 2.5.4-2.

5.3 Each EDG output rating is greater than the analyzed loads assigned in the respective emergency power supply system (EPSS) division and loads capable of being connected to the EPSS division through the alternate feed.

5.4 Valves listed in Table 2.5.4-2 fail to the position as shown in Table 2.5.4-2 on loss of power.

6.0 Equipment and System Performance

6.1 Each EDG is started by a protection system loss of offsite power (LOOP) signal from the respective EPSS division medium voltage bus.

6.2 Each EDG is started by a protection system safety injection system (SIS) actuation signal.

6.3 Each EDG will start and connect to the respective EPSS division medium voltage bus in an undervoltage condition concurrent with a SIS actuation signal.

6.4 The EDG lubricating oil system heat exchangers listed in Table 2.5.4-1 have the capacity to transfer the design heat load to the essential service water system.

6.5 Class 1E valves listed in Table 2.5.4-2 can perform the function listed in Table 2.5.4-1 under system operating ~~design~~ conditions.

6.6 The EDG cooling water system heat exchangers as listed in Table 2.5.4-1 have the capacity to transfer the design heat load to the essential service water.

6.7 Each EDG is capable of starting from standby conditions and achieving required voltage and frequency.

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7.0 Inspection, Tests, Analyses and Acceptance Criteria

Table 2.5.4-4 lists the EDG ITAAC.

Table 2.5.4-1—Emergency Diesel Generator Equipment Mechanical Design (14 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number [(1)]	~~Equipment~~ Location	ASME Code Section III	Function	Seismic Category
Emergency Diesel Generator	30XJA10 30XJA20 30XJA30 30XJA40	Division 1 EPGB Division 2 EPGB Division 3 EPGB Division 4 EPGB	N/A	Supply Emergency Power	I
Fuel Oil Storage Tank 14.03-11	~~30JXN10BB001~~30XJN10BB001 ~~30JXN20BB001~~30XJN20BB001 ~~30JXN30BB001~~30XJN30BB001 ~~30JXN40BB001~~30XJN40BB001	Division 1 EPGB Division 2 EPGB Division 3 EPGB Division 4 EPGB	Yes	Storage Volume	I
Fuel Oil Transfer Pump	30XJN10AP001A 30XJN20AP001A 30XJN30AP001A 30XJN40AP001A	Division 1 EPGB Division 2 EPGB Division 3 EPGB Division 4 EPGB	Yes	Run	I
Fuel Oil Day Tank	30XJN10BB002 30XJN20BB002 30XJN30BB002 30XJN40BB002	Division 1 EPGB Division 2 EPGB Division 3 EPGB Division 4 EPGB	Yes	Storage Volume	I
Fuel Oil Strainer	30XJN10AT260 30XJN20AT260 30XJN30AT260 30XJN40AT260	Division 1 EPGB Division 2 EPGB Division 3 EPGB Division 4 EPGB	Yes	Filter	I
Check Valve	30XJN10AA201 30XJN20AA201 30XJN30AA201 30XJN40AA201	Division 1 EPGB Division 2 EPGB Division 3 EPGB Division 4 EPGB	Yes	Open, Close	I

Table 2.5.4-3—Emergency Diesel Generator Electrical Equipment Design

~~Equipment~~ Description	~~Equipment~~ Tag Number [1]	MCR / RSS Displays	MCR / RSS Controls
Emergency Diesel Generator	30XKA10AG~~-~~[2] 14.3-11	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower
Emergency Diesel Generator	30XKA20AG[2]	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower
Emergency Diesel Generator	30XKA30AG~~-~~[2]	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower
Emergency Diesel Generator	30XKA40AG~~-~~[2] 14.3-11	Generator voltage, current, frequency, power, reactive power. Engine running, not running / Generator voltage, current, frequency, power, reactive power. Engine running, not running	Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower / Generator output voltage raise-lower, output breaker close-trip. Engine start-stop, governor raise-lower

1) Equipment tag numbers are provided for information only and are not part of the certified design.

2) Emergency Diesel Generators are Class 1E.

Table 2.5.4-4—Emergency Diesel Generator ITAAC (~~7~~ 10 Sheets)

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
5.3	Each EDG output rating is greater than the analyzed loads assigned in the respective EPSS division and loads capable of being connected to the EPSS division through the alternate feed.	An analysis will be performed. 14.03.03-43	An analysis concludes: a. Each EDG output rating is greater than the analyzed loads assigned in the respective EPSS division and loads capable of being connected to the EPSS division through the alternate feed. ~~b. Each EDG provides the minimum required operating voltage at the supplied safety-related equipment with the EDG steady-state output voltage at ± 5 percent and steady-state frequency at ± 2 percent of nominal.~~
5.4	Valves listed in Table 2.5.4-2 fail to the position as shown in Table 2.5.4-2 on loss of power.	Testing will be performed for the valves listed in Table 2.5.4-2 to verify the position of valves on loss of power.	Following the loss of power, the valves listed in Table 2.5.4-2 fail to the position as shown in Table 2.5.4-2.
6.1	Each EDG is started by a protection system LOOP signal from the respective EPSS division medium voltage bus.	A test will be performed.	Each EDG is started by a protection system LOOP signal from the respective EPSS division medium voltage bus, achieves rated speed and voltage and connects to the assigned EPSS bus in ≤ 15 Seconds.
6.2	Each EDG is started by a protection system SIS actuation signal.	A test will be performed.	Each EDG is started by a protection system SIS actuation signal, achieves rated speed and voltage and remains disconnected from the EPSS.

Table 2.5.4-4—Emergency Diesel Generator ITAAC (~~7~~ 10 Sheets)

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	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
6.7	Each EDG is capable of starting from standby conditions and achieving required voltage and frequency.	A test will be performed.	Each EDG starts from standby conditions and achieves voltage ≥ 6555 V and frequency ≥ 58.8 Hz in ≤ 15 seconds; and steady state voltage ≥ 6555 V and ≤ 7260 V, frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Next File

2.6.9 Emergency Power Generating Building Ventilation System

1.0 Description

The emergency power generating building ventilation system (EPGBVS) controls the temperature, humidity and air change rate in the Emergency Power Generating Buildings (EPGB) for personnel comfort, personnel safety, and equipment protection during operation of the emergency diesel generators (EDG). The EPGBVS provides ventilation of the diesel hall, electrical room, and main tank room; and cooling of the electrical room for each of the four divisions of the EPGBs to remove equipment heat, and heat generated from other sources. The EPGBVS also provides heat to maintain a minimum temperature in the buildings.

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Each division of the EPGBs has its own independent heating, ventilation and air conditioning system which is not connected to other divisions. Two divisions are located in each of the two EPGBs. EPGBVS Divisions 1 and 2 are located in EPG Building 1/2 and Divisions 3 and 4 in EPG Building 3/4 During normal plant operation, the EDGs do not operate, however the EPGBVS maintains an acceptable ambient temperature for the startup of EDGs and for personnel comfort.

The EPGBVS provides the following safety related functions:

- Removes heat generated by the EDGs during operation of the EDGs to maintain acceptable operating conditions in the diesel hall.
- Maintains acceptable ambient conditions in the electrical room and main tank room.
- Maintains environmental conditions for startup of the EDGs.

The EPGBVS provides the following non-safety related functions:

- Maintains the room ambient conditions to allow personnel access during normal operation.
- Provides sufficient ventilation to maintain required air renewal rates.

2.0 Arrangement

2.1 The functional arrangement of the EPGBVS is as shown in the following figures:

- Figure 2.6.9-1—Emergency Power Generating Building Ventilation System Functional Arrangement, Division 1.
- Figure 2.6.9-2—Emergency Power Generating Building Ventilation System Functional Arrangement, Division 2.
- Figure 2.6.9-3—Emergency Power Generating Building Ventilation System Functional Arrangement, Division 3.

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

Equipment Description	Equipment Tag Number [(1)]	Equipment Location	ASME AG-1 Code	Function	Seismic Category
Fresh Air Supply					
Back draft dampers	30SAD11AA001 30SAD21AA001 30SAD31AA001 30SAD41AA001 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 EPGB 1 EPGB 2 EPGB 3 EPGB 4	Yes	N/A	I
Back draft dampers	30SAD11AA002 30SAD21AA002 30SAD31AA002 30SAD41AA002	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 EPGB 1 EPGB 2 EPGB 3 EPGB 4	Yes	N/A	I
Prefilters	30SAD11AT001 30SAD21AT001 30SAD31AT001 30SAD41AT001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 EPGB 1 EPGB 2 EPGB 3 EPGB 4	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number [(1)]	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Prefilters	30SAD11AT002 30SAD21AT002 30SAD31AT002 30SAD41AT002 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Supply air fans	30SAD11AN001 30SAD21AN001 30SAD31AN001 30SAD41AN001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	Run	I
Supply air fans	30SAD11AN002 30SAD21AN002 30SAD31AN002 30SAD41AN002	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	Run	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Diesel Hall Air Supply and Exhaust					
Manual dampers	30SAD12AA001 30SAD22AA001 30SAD32AA001 30SAD42AA001 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Manual dampers	30SAD12AA002 30SAD22AA002 30SAD32AA002 30SAD42AA002	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Manual dampers	30SAD12AA003 30SAD22AA003 30SAD32AA003 30SAD42AA003	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Manual dampers	30SAD12AA004 30SAD22AA004 30SAD32AA004 30SAD42AA004 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Manual dampers	30SAD12AA005 30SAD22AA005 30SAD32AA005 30SAD42AA005	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Exhaust fans	30SAD15AN001 30SAD25AN001 30SAD35AN001 30SAD45AN001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Exhaust fans	30SAD15AN002 30SAD25AN002 30SAD35AN002 30SAD45AN002 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Back draft dampers	30SAD15AA001 30SAD25AA001 30SAD35AA001 30SAD45AA001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Back draft dampers	30SAD15AA002 30SAD25AA002 30SAD35AA002 30SAD45AA002	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Electrical Room Air Supply and Recirculation					
Motor operated dampers	30SAD13AA001 30SAD23AA001 30SAD33AA001 30SAD43AA001 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	Open	I
Manual dampers	30SAD13AA002 30SAD23AA002 30SAD33AA002 30SAD43AA002	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Pre-filters	30SAD13AT001 30SAD23AT001 30SAD33AT001 30SAD43AT001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
HEPA filters	30SAD13AT002 30SAD23AT002 30SAD33AT002 30SAD43AT002 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Cooling Coils	30SAD13AC001 30SAD23AC001 30SAD33AC001 30SAD43AC001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Moisture separators	30SAD13AT003 30SAD23AT003 30SAD33AT003 30SAD43AT003	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Electric Heaters	30SAD13AH001 30SAD23AH001 30SAD33AH001 30SAD43AH001 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	On / Off	I
Supply air fans	30SAD13AN001 30SAD23AN001 30SAD33AN001 30SAD43AN001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	Run	I
Humidifiers	30SAD13AH002 30SAD23AH002 30SAD33AH002 30SAD43AH002	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number [(1)]	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Back draft dampers	30SAD13AA003 30SAD23AA003 30SAD33AA003 30SAD43AA003 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Back draft dampers	30SAD13AA006 30SAD23AA006 30SAD33AA006 30SAD43AA006	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Main Tank Room Air Supply and Exhaust					
Back draft dampers	30SAD16AA001 30SAD26AA001 30SAD36AA001 30SAD46AA001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number [(1)]	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Manual dampers	30SAD16AA003 30SAD26AA003 30SAD36AA003 30SAD46AA003 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Manual dampers	30SAD16AA004 30SAD26AA004 30SAD36AA004 30SAD46AA004	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Exhaust fans	30SAD16AN001 30SAD26AN001 30SAD36AN001 30SAD46AN001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	Run	I

Table 2.6.9-1—Emergency Power Generating Building Ventilation System Equipment Mechanical Design (6 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	ASME AG-1 Code	Function	Seismic Category
Back draft damper	30SAD16AA005 30SAD26AA005 30SAD36AA005 30SAD46AA005 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Yes	N/A	I
Fan Heaters	30SAD14AH001 30SAD14AH002 30SAD14AH003 30SAD14AH004	1/2 EPGB, Division 1 ~~EPGB 1~~	Yes	On / Off	I
Fan Heaters	30SAD24AH001 30SAD24AH002 30SAD24AH003 30SAD24AH004	1/2 EPGB, Division 2 ~~EPGB 2~~	Yes	On / Off	I
Fan Heaters	30SAD34AH001 30SAD34AH002 30SAD34AH003 30SAD34AH004	3/4 EPGB, Division 3 ~~EPGB 3~~	Yes	On / Off	I
Fan Heaters	30SAD44AH001 30SAD44AH002 30SAD44AH003 30SAD44AH004	3/4 EPGB, Division 4 ~~EPGB 4~~	Yes	On / Off	I

1) Equipment tag numbers are provided for information only and are not part of the certified design.

Table 2.6.9-2—Emergency Power Generating Building Ventilation System Equipment I&C and Electrical Design (~~2~~ 4 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number [(1)]	~~Equipment~~ Location	IEEE Class 1E	Failure Position	PACS	MCR / RSS Displays	MCR / RSS Controls
Supply air fans	30SAD11AN001 30SAD21AN001 30SAD31AN001 30SAD41AN001 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Division 1 Division 2 Division 3 Division 4	N/A	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Supply air fans	30SAD11AN002 30SAD21AN002 30SAD31AN002 30SAD41AN002	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Division 1 Division 2 Division 3 Division 4	N/A	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Exhaust fans	30SAD15AN001 30SAD25AN001 30SAD35AN001 30SAD45AN001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Division 1 Division 2 Division 3 Division 4	N/A	Yes	On-Off / On-Off	Run-Stop / Run-Stop

Table 2.6.9-2—Emergency Power Generating Building Ventilation System Equipment I&C and Electrical Design (2 4 Sheets)

Equipment Description	Equipment Tag Number [(1)]	Equipment Location	IEEE Class 1E	Failure Position	PACS	MCR / RSS Displays	MCR / RSS Controls
Exhaust fans	30SAD15AN002 30SAD25AN002 30SAD35AN002 30SAD45AN002 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 EPGB 1 EPGB 2 EPGB 3 EPGB 4	Division 1 Division 2 Division 3 Division 4	N/A	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Motor operated dampers	30SAD13AA001 30SAD23AA001 30SAD33AA001 30SAD43AA001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 EPGB 1 EPGB 2 EPGB 3 EPGB 4	Division 1 Division 2 Division 3 Division 4	Close	Yes	Position / Position	Open-Close / Open-Close
Electric Heaters	30SAD13AH001 30SAD23AH001 30SAD33AH001 30SAD43AH001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 EPGB 1 EPGB 2 EPGB 3 EPGB 4	Division 1 Division 2 Division 3 Division 4	N/A	Yes	On-Off / On-Off	Start-Stop / Start-Stop

Table 2.6.9-2—Emergency Power Generating Building Ventilation System Equipment I&C and Electrical Design (~~2~~ 4 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	IEEE Class 1E	Failure Position	PACS	MCR / RSS Displays	MCR / RSS Controls
Supply air fans	30SAD13AN001 30SAD23AN001 30SAD33AN001 30SAD43AN001 14.03.03-44	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Division 1 Division 2 Division 3 Division 4	N/A	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Exhaust fans	30SAD16AN001 30SAD26AN001 30SAD36AN001 30SAD46AN001	1/2 EPGB, Division 1 1/2 EPGB, Division 2 3/4 EPGB, Division 3 3/4 EPGB, Division 4 ~~EPGB 1~~ ~~EPGB 2~~ ~~EPGB 3~~ ~~EPGB 4~~	Division 1 Division 2 Division 3 Division 4	N/A	Yes	On-Off / On-Off	Run-Stop / Run-Stop
Fan Heaters	30SAD14AH001 30SAD14AH002 30SAD14AH003 30SAD14AH004	1/2 EPGB, Division 1 ~~EPGB 1~~	Division 1	N/A	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Fan Heaters	30SAD24AH001 30SAD24AH002 30SAD24AH003 30SAD24AH004	1/2 EPGB, Division 2 ~~EPGB 2~~	Division 2	N/A	Yes	On-Off / On-Off	Start-Stop / Start-Stop
Fan Heaters	30SAD34AH001 30SAD34AH002 30SAD34AH003 30SAD34AH004	3/4 EPGB, Division 3 ~~EPGB 3~~	Division 3	N/A	Yes	On-Off / On-Off	Start-Stop / Start-Stop

Table 2.6.9-2—Emergency Power Generating Building Ventilation System Equipment I&C and Electrical Design (~~2~~ 4 Sheets)

~~Equipment~~ Description	~~Equipment~~ Tag Number (1)	~~Equipment~~ Location	IEEE Class 1E	Failure Position	PACS	MCR / RSS Displays	MCR / RSS Controls
Fan Heaters	30SAD44AH001 30SAD44AH002 30SAD44AH003 30SAD44AH004	3/4 EPGB, Division 4 ~~EPGB 4~~	Division 4	N/A	Yes	On-Off / On-Off	Start-Stop / Start-Stop

14.03.03-44

1) Equipment tag numbers are provided for information only and are not part of the certified design.