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JAN 13 1993

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Gentlemen:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

WATTS BAR NUCLEAR PLANT (WBN) - INITIAL TEST PROGRAM - RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION (RAI) ON FSAR CHAPTER 14, AMENDMENT 69 (TAC M82644 and M82645)

NRC's letter of July 14, 1992, documented the staff's evaluation of the subject FSAR amendment and requested additional information needed to complete their review. Enclosure 1 provides TVA's response to this RAI. Enclosure 2 provides proposed FSAR Chapter 14 preoperational test abstracts (Table 14.2-1) revised pursuant to the responses in Enclosure 1. TVA will submit these abstracts in a future FSAR amendment pending NRC review. Please note that proposed abstracts for power ascension phase tests (Table 14.2-2) are not enclosed. These test summaries will be submitted prior to WBN's scheduled engineering completion date for safety-related systems (currently June 1993).

If you have any questions, please telephone Paul L. Pace at (615) 365-1824.

Very truly yours,

W. J. Museler

William J. Museler

Enclosures
cc: See page 2

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JAN 13 1993

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50-390 TVA WATTS BAR

INITIAL TEST PROGRAM - RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION ON FSAR CHAPTER 14, AMDT 69.

REC'D W/LTR DTD 01/13/93....9301220177

PART 1

1. Section 14.2.1, "Summary of Test Program and Objectives" was rewritten to describe the overall purpose, direction, and management of the Initial Test Program (ITP). The changes to this section include that preoperational testing will be completed prior to fuel load with certain limited exceptions where tests or parts of tests may be deferred into the power ascension phase. Section 14.2.1 should be modified to state that completion of the preoperational testing phase (including review and approval of the test results) is required prior to fuel loading and if portions of any preoperational tests are intended to be conducted or their results approved after fuel loading to:

   (1) List each test,
   (2) State which portions of each test will be delayed until after fuel loading,
   (3) Provide technical justification for delaying these portions, and
   (4) State the power levels where each test will be completed.

   Response:

   The fourth paragraph of FSAR Section 14.2.1 will be revised to read as follows:

   "Tests summarized in Table 14.2-1, will be completed and test results approved prior to commencing fuel load. Any tests which can not be completed prior to fuel load will be evaluated to assure incomplete tests will not adversely affect fuel loading operations or cause features that have not been tested to be relied upon for safe plant operation. The Joint Test Group (JTG) and the Plant Operating Review Committee (PORC) will review and approve the technical justification for delaying test completion until after fuel load. If approved by the PORC, the technical justification and schedule, including power level for completion of delayed testing, will be provided to the NRC staff prior to fuel load."

2. Section 14.2.2, "Organization and Staffing" lists the titles of various staff positions and details the responsibilities of these positions. Two positions, System Test Engineers (14.2.2.1.3) and Power Ascension Test Engineers (14.2.2.2.2) do not indicate to whom they report. These Sections should be modified to indicate reportability.

Response:

FSAR Sections 14.2.2.1.3 and 14.2.2.2.2 will be revised to identify to whom System Test Engineers and Power Ascension Test Engineers report. Additional changes will be made to these sections to further clarify their responsibilities. The following revisions will be made:

A. The first paragraph of FSAR Section 14.2.2.1.3 will be revised to read:

" 14.2.2.1.3 <u>System Test Engineers</u>

System Test Engineers are members of the Startup and Test organization and report through a discipline group supervisor to the Startup and Test Manager. Their duties and responsibilities include:"

B. The following responsibility will be added to Section 14.2.2.1.3 as item 2 and the remaining items renumbered.

" 2. Performance of component, acceptance and preoperational tests;"

C. The first paragraph of FSAR Section 14.2.2.2.2 will be revised to read as follows:

" 14.2.2.2.2 <u>Power Ascension Test Engineers</u>

Power Ascension Test Engineers report to supervisors under the plant manager and will be responsible for the conduct and direction of tests during the power ascension test phase. Their duties and responsibilities include:"

D. The following responsibility will be added to Section 14.2.2.2.2 as item 2 and the remaining items renumbered.

" 2. Performance of power ascension tests;"

3. Subsection 14.2.3.5, "Test Procedure Revisions/Changes" describes different requirements for the level of approvals for changes to preoperational test procedures and power ascension test procedures depending on whether the change involves a change to the intent or not. The criteria for determining what constitutes a change to intent has not been provided. Subsection 14.2.3.5 should be modified to define changes to the intent, (e.g., any change that affects ITP FSAR commitments) so that consistent criteria are applied in determining which test procedure changes involve changes to the intent and therefore obtain approval levels that are consistent.

Response:

WBN considers the "intent of a test" to be defined within a test procedure by the test objectives and acceptance criteria. The test objectives and acceptance criteria include as a minimum FSAR ITP commitments.

FSAR Section 14.2.3.5 will be revised to describe a change of intent and the review and approval requirements as follows:

"1. Preoperational Test Procedures

a. Minor changes to test procedures such as editorial corrections or other changes that do not change the test objectives or acceptance criteria will be approved by the assigned test engineer and another individual qualified for review and approval of test procedures as described in Section 14.2.2.7.

b. Changes to test procedures that change the intent of the test, as described in the test objectives and acceptance criteria, will be reviewed and approved in the same manner as the original test procedures as described in Section 14.2.3.3.

c. All test procedure changes will be included with the completed test procedure/results package and subject to final review and approval as described in Section 14.2.5.

2. Power Ascension Test Procedures

a. Minor changes to initial power ascension test procedures such as editorial corrections or other changes that do not change the test objectives or acceptance criteria will have the Shift Supervisor's concurrence and approval of the person in charge of the test.

b. Changes to initial power ascension tests that change the intent of the test, as described in the test objectives and acceptance criteria will be reviewed and approved in the same manner as the original test."

4. Subsection 14.2.4.2, "Component Testing" indicates the Startup and Test organization will conduct component and preoperational testing. This organization is not identified in Section 14.2.2, "Organization and Staffing", although the name implies that this organization works under the direction of the Startup and Test Manager. Section 14.2.4.2 or Section 14.2.2 should be modified to describe the Startup and Test organization.

Response: Section 14.2.2 will be revised to provide a more complete description of the current Startup and Test organization. The following revisions will be made:

A. Revise Section 14.2.2 to read as follows:

The Site Vice President has overall responsibility for the initial test program. Implementation of the initial test program is the responsibility of the Plant Manager.

The Plant Manager reports to the Site Vice President and has overall responsibility for component, acceptance, and preoperational testing performed by the Startup and Test organization.

The Plant Manager also has overall responsibility for Power Ascension testing performed by the Technical Support organization.

Responsibilities of the Startup and Test and Plant Operating organizations and personnel are discussed below."

B. Revise Section 14.2.2.1 to read as follows:

" 14.2.2.1 Startup and Test Organization

The Startup and Test organization consists of management personnel, system test engineers, and support personnel necessary to conduct preoperational test phase activities.

The Startup Manager reports to the Plant Manager and is responsible for management of the Startup and Test organization. Reporting to the Startup Manager for test-related activities is the Startup Test Manager and the Joint Test Group Chairman . Other non-test functions reporting to the Startup Manager are described in the startup administrative procedures.

Responsibilities of the Startup Manager, Startup Test Manager, and system test engineers are provided below. Responsibilities of the Joint Test Group are described in Section 14.2.2.5."

C. Revise the first paragraph of section 14.2.2.1.1 to read as follows; the specific responsibilities of the Startup Manager remain the same:

"14.2.2.1.1 Startup Manager

The Startup Manager is responsible for the overall management of the Startup and Test organization including coordination and implementation of component, acceptance and preoperational test activities. The responsibilities of the Startup Manager include:"

D. The previous title "Startup and Acceptance Test Manager" has been changed to Startup Test Manager". The FSAR will be revised to reflect these title changes as follows:

(1) Change "Startup and Acceptance Test Manager" to "Startup Test Manager" in Section 14.2.2.1.2.

E. **Change the title of Section 14.2.2.2 from "Plant Manager" to "Plant Operating Organization" and revise the first paragraph to read as follows:**

" The Plant Operating organization is described in Chapter 13. With regard to the initial test program, the Plant Manager reports to the Site Vice President and is responsible for overall management of component, acceptance, preoperational, and power ascension testing."

5. Section 14.2.5, "Review, Evaluation, and Approval of Test Results" was changed to state that reviews of test status and test results after each major phase will be performed to the extent required before proceeding to the next major test phase. Section 14.2.5 should be modified to state that results of completed tests will be evaluated by the appropriate designated personnel or groups and appropriate remedial actions, including retesting, will be taken if acceptance criteria are not satisfied, before proceeding to the next major test phase.

Response:

The first sentence of the last paragraph of Section 14.2.5 will be modified as follows:

"Following each major phase of the test program, test results and/or test status will be reviewed to ensure all required tests have been performed and acceptance criteria satisfied; all test deficiencies have been properly dispositioned and appropriate retesting completed; and the test results have been reviewed and approved by appropriate designated personnel prior to proceeding to the next major test phase."

6. Section 14.2.6, "Test Records" was changed to state that initial test program records will be processed, controlled, and retained in accordance with the requirements of the WBN Quality Assurance Program and project implementing procedures. Either Section 14.2.6 should be modified to state that preoperational test procedures and results will be retained as part of the plant historical record and that a summary of startup testing will be provided in a startup report, as discussed in Regulatory Guide 1.16, "Reporting of Operating Information - Appendix A Technical Specifications," and will include the items described in Regulatory Guide 1.68, Regulatory Position C.9, or it should be demonstrated that such items are covered by the documents referenced in Section 14.2.6.

Response:

Section 14.2.6 will be modified to read as follows:

" 14.2.6 <u>Test Records</u>

> **Test documentation such as, test procedures, test results, test deficiencies and test changes relating to the initial test program will be processed, controlled, and retained as a plant historical record in accordance with requirements of the WBN Quality Assurance program and project implementing procedures. A summary of power ascension testing will be provided in a Power Ascension Test Report in accordance with requirements of the WBN Technical Specifications."**

7. Section 14.2.7, "Conformance of Test Programs With Regulatory Guides" was rewritten to describe exceptions taken to applicable Regulatory Guides. This change replaces Table 14.2-3, "Conformance of Preoperational Test Program with Regulatory Guides", last revised in Amendment 49, and changes previous testing commitments related to individual Regulatory Guides. Additional information needed related to these changes are as indicated in the following comments:

a. Compliance with the following Regulatory Guides should be addressed:

1. RG 1.68.3, "Preoperational Testing of Instrument and Control Air Systems", April 1982.

Response:

Regulatory Guide 1.80 "Preoperational Testing of Instrument Air Systems" will be deleted from FSAR Sections 9.3.1.4 and 14.2.7.7 and replaced with Regulatory Guide 1.68.3, April 1982, "Preoperational Testing of Instrument and Control Air Systems". The FSAR will be revised to read as follows:

A. The first sentence of Section 9.3.1.4 will be deleted. The remaining portion of the section provides adequate reference to Chapter 14 for preoperational testing of the control air system.

B. Revise Section 14.2.7.7 to read as follows:

" 7. RG 1.68.3, "Preoperational Testing of Instrument and Control Air Systems"

Discussion: Preoperational testing of the Instrument and Control Air Systems will comply with RG 1.68.3, April 1982, with the following exceptions:

a. Regulatory Position C.8

Auxiliary Control Air System loads will not be tested to verify their response to a sudden loss of system pressure. NRC concurrence with this exception is reflected in correspondence from R.C. Lewis to H.G. Parris dated February 28, 1984.

b. **Regulatory Position C.8**

Non-safety related loads will not be tested to verify their response to a loss of system pressure as part of the Auxiliary Control Air System preoperational test. The Auxiliary Control Air System does not supply air to non-safety related loads. However, non-safety related air operated components will be tested on a component basis to verify proper response to a loss of air condition.

c. **Regulatory Position C.11**

Functional testing to demonstrate operability of compressed air system loads under increased pressure conditions will not be performed. The safety evaluation of the system indicates that the system is adequately designed to prevent system overpressure as described in FSAR Section 9.3.1.3."

2. RG 1.95, "Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release", Revision 1, January 1977.

Response:

The potential for chlorine to pose a hazard to main control room (MCR) operators due to onsite storage spills or transportation incidents in the vicinity of the site is analyzed in FSAR Chapter 6, Section 6.4.4.2. The analysis concluded that no hazard to control room habitability is posed by chemicals stored on site, offsite within a 5-mile radius, or transported by the site by barge, rail, or road within a 5-mile radius. Therefore, the requirements of RG 1.95, Revision 1, (January 1977) "Protection of Nuclear Power Plant Control Room Operators Against an Accidental Chlorine Release" do not apply.

3. RG 1.139, "Guidance for Residual Heat Removal", for comment, May 1978.

Response:

This regulatory guide will not be used for development or conduct of the WBN initial test program.

A final report of a comparison between WBN and Sequoyah was submitted to the NRC in August 17, 1981. This study addressed requirements of Regulatory Guide 1.139 and Branch Technical Position RSB 5-1. This report indicated that preoperational test results to demonstrate natural circulation cooldown capability at Diablo Canyon were applicable to the WBN design and satisfy NRC requirements for natural circulation tests. Safety Evaluation Report (NUREG -0847) issued June, 1982 confirmed acceptability of this approach pending review of Diablo Canyon test results.

More recently on July 11, 1991, TVA provided an assessment of the applicability of the Diablo Canyon natural circulation test to WBN. This assessment concluded that natural circulation tests are not required at WBN, and was accepted by the NRC staff by correspondence dated July 14, 1992.

Exception has been taken to RG 1.68, Revision 2, requirements for performing natural circulation tests of the reactor coolant system as described in FSAR Section previously numbered 14.2.7.4.a(10) [new paragraph 14.2.7.4.a(5)].

4. RG 1.140, "Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants", Revision 1, October 1979.

Response:

FSAR Section 14.2.7 will be revised to add RG 1.140, Revision 1 (May 1980). A new paragraph, 14.2.7.10, will be added to read as follows:

" 10. RG 1.140, " Design, Testing, and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants"

Discussion: Testing of normal (non-safety related) ventilation exhaust filtration systems will be performed in full compliance with guidance provided by this Regulatory Guide."

b. Regulatory Guide 1.68, "Initial Test Program for Water-Cooled Nuclear Power Plants" was changed from a position of full compliance to take various exceptions (Section 14.2.7.4.a). Under Regulatory Position C.1, certain comments are referred to as "clarifications" when they in fact are either alternate approaches or exceptions. These comments should be described as such and categorized in the appropriate discussion area.

Response:

The change from full compliance with RG 1.68, Revision 0, to compliance with RG 1.68, Revision 2 (with exceptions), does not reduce WBN's commitment to perform preoperational tests of all safety related components, systems, and structures and appropriate tests of non-safety related systems. WBN is committed to use RG 1.68, Revision 2, for development and conduct of the initial test program. Section 14.2.7 will be revised to clearly identify and differentiate all exceptions and alternate approaches to the regulatory guidance. The following revisions will be made:

A. Revise Section 14.2.7, first paragraph, to read as follows:

" The initial test program will be developed and conducted in accordance with the following applicable regulatory guides (RG). In certain cases, exceptions or alternate approaches to regulatory guidance are planned. Justification for these exceptions or alternate approaches are provided with the applicable regulatory guide."

B. Revise Section 14.2.7.4, introductory discussion sentence, as follows:

"Discussion: The initial test program complies with the requirements of RG 1.68, Revision 2 (8/78), with the following exceptions and/or alternate approaches:"

C. Delete the first (introductory) sentence to Section 14.2.7.4.a.

D. Delete existing paragraphs 14.2.7.4.a (2), (3), (5), (8), and (9) and re-number remaining paragraphs.

E. Revise paragraph 14.2.7.4.a(6) [new paragraph 14.2.7.4.a(3)] to read as follows:

" (3) Appendix A, subparagraphs 1.j.22, 1.k.2, 1.k.3

The subject equipment is calibrated and functionally tested as part of the WBN plant instrument calibration program. The calibration and functional testing is performed and documented in accordance with approved plant calibration procedures. Therefore, additional testing in the form of a preoperational test is not warranted.

F. Revise paragraph 14.2.7.4.a (10) [new paragraph 14.2.7.4.a (5)], first sentence, to read as follows:

" (5) Appendix A, subparagraph 4.t

Natural circulation tests of the reactor coolant system will not be performed. Such tests have been successfully completed at..."

c. All of the items of Regulatory Guide 1.68, Appendix A, were not addressed in either the exceptions to Regulatory Guidance or in the individual test summaries provided under Tables 14.2-1 and 14.2-2 (Section 14.2.7, 4.a). For the following items from Regulatory Guide 1.68, Appendix A, either 1) modify Section 14.2.7 to provide appropriate technical justifications for exceptions to these items, 2) modify existing or add additional test summaries to address these items, and/or 3) explain where existing test summaries address these 25 items:

1.b.1, 1.d.10, 1.h.6, 1.i.13, 1.i.15, 1.i.21, 1.j.7, 1.j.8, 1.j.9, 1.j.11, 1.l.4, 1.l.5, 1.m.3, 1.m.6, 1.n.15, 1.n.16, 4.l, 4.n, 5.n, 5.q, 5.r, 5.w, 5.x, 5.ee, 5.ff.

Response:

The 25 items in question are responded to as follows:

1. 1.b.1 - Component tests will be performed to verify proper installation, calibration, and operation of Reactor Control equipment prior to fuel load. Proper operation of the complete system will be demonstrated after fuel load during the power ascension test phase as described in the test summary provided in Table 14.2-2.

2. 1.d.10 - Emergency cooling towers are not included in the WBN design.

3. 1.h.6 - Preoperational testing of the air return fans will be performed as described in the Containment Ventilation System test summary provided in Table 14.2-1.

4. 1.i.13 - A containment inerting system is not included in the WBN design.

5. 1.i.15 - The WBN design does not include a containment penetration pressurization system.

6. 1.i.21 - The WBN design does not include a containment penetration cooling system.

7. 1.j.7 - The "Liquid Waste Drains, Collection and Transfer" test summary provided in Table 14.2-1 has been revised to include flood detection instrumentation and passive sump operation.

8. 1.j.8 - Refer to response provided for request 7.c, item 1, above.

9. 1.j.9 - Pressure Control Systems used to maintain differential pressure across boundary valves are not included in the WBN design.

10. 1.j.11 - Testing of the Traversing Incore Probe System is included in the Power Ascension Test Program. A test summary, "Incore Movable Detectors", is provided in Table 14.2-2.

11. 1.1.4 - The FSAR, Table 14.2-1 has been revised to include a test summary for the Steam Generator Blowdown System.

12. 1.1.5 - The FSAR, Table 14.2-1 has been revised to include a Condensate and Condenser Vacuum System test summary which describes testing of condenser offgas system isolation features.

13. 1.m.3 - The FSAR, Table 14.2-1, "Spent Fuel Pool Cooling System" test summary has been revised to include verification of the operability and leak tightness of sectionalizing devices and drains and leak tests of gaskets or bellows in the refueling canal and fuel storage pool.

14. 1.m.6 - Performance of spent fuel pool and fuel handling area ventilation equipment will be demonstrated as part of Auxiliary Building Ventilation System tests. Table 14.2-1 test summary for Auxiliary Building Ventilation has been revised to clarify spent fuel pool and fuel handling area test requirements.

15. 1.n.15 - WBN design does not include a shield cooling system. The space between the reactor vessel and shield wall in containment is cooled by the lower compartment air cooling system in conjunction with the CRDM air cooling system. Performance of these systems will be demonstrated during Integrated Hot Functional Testing. The test summary for Containment Ventilation has been revised to clarify test requirements to verify proper cooling of the space around the reactor vessel.

16. 1.n.16 - A separate cooling and heating system for the RWST is not included in the WBN design. Testing of RWST freeze protection has been included in the revised Safety Injection System Test summary in Table 14.2-1.

17. 4.1 - Operability, including stroke times, of main steam line and branch steam line valves and bypass valves used for protective isolation functions will be demonstrated at rated temperature and pressure conditions during Hot Functional Testing. The test summary for Integrated Hot Functional Testing has been revised to clarify test requirements for steam line valves which provide protective functions.

18. 4.n - Performance of the Process Computer System will be demonstrated prior to fuel load. Refer to the Process Computer Preoperational Test Summary provided in Table 14.2-1.

19. 5.n - Table 14.2-2 will be revised to include a power ascension test for the Loose Parts Monitoring System.

20. 5.q - Testing of the failed fuel detector is included in the preoperational test summary for the Process Radiation Monitoring System (test method 3) provided in Table 14.2-1. However, plans are underway to abandon the system in which case testing will not be applicable.

21. 5.r - Preoperational testing of the process computer validates performance calculations and verification of proper input sources. A test summary for the Computer System is provided in Table 14.2-1. The power ascension test summary for Thermal Power Measurement and Statepoint Data Collection provided in Table 14.2-2 will be revised to address collection of process computer data and comparison to plant indications.

22. 5.w - Adequate cooling of the space around the reactor vessel will be demonstrated during Integrated Hot Functional Testing. See response to item 15 (1.n.15) above.

23. 5.x - WBN does not intend to provide a test summary for this item nor take exception to this item since these functions will be confirmed through normal plant tests.

Initial performance testing of the "Auxiliary Systems" defined in paragraph 5.x are conducted during the preoperational test phase prior to fuel load. Refer to the Table 14.2-1 test summaries for the following systems:

Essential Raw Cooling Water
Component Cooling Water
Diesel Generator Building Ventilation
Control Building Ventilation
Auxiliary building Ventilation

WBN will continue to monitor the performance of these "auxiliary systems" prior to fuel load and during power operations. WBN will conduct periodic surveillance tests to monitor the performance of safety-related systems in accordance with Technical Specification and Technical Requirements. WBN has also committed to monitoring the performance of important plant heat exchangers and coolers in response to NRC Generic Letter 89-13.

24. 5.ee - **A containment inerting system is not included in the WBN design. Proper operation of containment purge will be demonstrated during the preoperational testing phase as described by the Containment Ventilation System test summary provided in Table 14.2-1**

25. 5.ff - WBN does not intend to provide a test summary for this item nor take exception to this item since these functions will be confirmed through normal plant tests.

Initial performance testing of the "important ventilation and air conditioning systems" defined in paragraph 5.ff are conducted during the preoperational test phase prior to fuel load. Refer to the Table 14.2-1 test summaries for the following systems:

Containment Ventilation
Secondary Containment Ventilation
Diesel Generator Building Ventilation
Control Building Ventilation
Auxiliary building Ventilation

WBN will continue to monitor the performance of these "important ventilation and air conditioning systems" prior to fuel load and during power operations. WBN will conduct periodic surveillance tests to monitor the performance of safety-related systems in accordance with Technical Specification and Technical Requirements. WBN has also committed to monitoring the performance of important plant heat exchangers and coolers in response to NRC Generic Letter 89-13.

d. For RG 1.68, Appendix A, exception is taken to performing preoperational tests for various designated items and the components and systems associated with these items (Section 14.2.7.4.a(2)). This change states that these components and systems perform no safety-related function and are not required for safe shutdown and cooldown of the reactor under normal or upset conditions as described in the applicable sections of the FSAR. This change states that "Acceptance Testing" as described in FSAR Section 14.2.1 will be performed in accordance with applicable startup administrative procedure requirements for these components and systems. Section 14.2.4, "Conduct of Test Program" and Section 14.2.5, "Review, Evaluation, and Approval of Test Results" do not address "Acceptance Testing" but do describe "Component Testing" and "Preoperational Testing". Regulatory Guide 1.68 allows for applications of a graded approach to the ITP. A graded approach for the components and systems to be tested by "Acceptance Testing" would be acceptable if the guidance provided in RG 1.68, Appendix A is addressed by incorporating "Acceptance Tests" into the ITP to verify proper operation of these components and systems. Sections 14.2.4, 14.2.5, 14.2.7, and the individual test summaries described in Tables 14.2-1 and 14.2-2 should be modified to address the "Acceptance Test" process and to provide specific test abstracts for the noted components and systems.

Response:

Section 14.2.7.4.a(2) has been deleted as discussed in response to request 7.b above. Test summaries for major non-safety related systems used for shutdown and cooldown of the reactor under normal plant conditions have been added to Table 14.2-1. Tests which are summarized in Table 14.2-1 will be performed in accordance with component and/or preoperational type test procedures which are currently described in Chapter 14. The following FSAR changes have been made to include additional non-safety related components, systems, and design features in the initial test program and clarify requirements applicable to the tests summarized in Table 14.2-1:

1. Replace the third paragraph of Section 14.2.1 in its entirety with the following new paragraph:

"The initial test program is divided into two phases, the preoperational test phase and the power ascension test phase. Preoperational phase testing will be performed prior to fuel load and power ascension testing will be performed during and following fuel loading activities. During each of these two phases, tests will be performed to verify design requirements of safety related and selected non-safety-related components, systems, and structures. A graded approach, based on criteria provided in Regulatory Guide 1.68, Revision 2, will be used for selection of plant structures, systems, components, and design features to be included in the initial test program. During the preoperational testing phase, two types of tests will be performed to satisfy FSAR test requirements; (1) component tests, and (2) preoperational tests. Component tests will be performed on safety related and non-safety-related components to verify proper installation and cleanliness and to demonstrate performance of individual components to be in accordance with design requirements. Preoperational tests will be performed on safety related and selected non-safety related structures, systems and components as required to demonstrate performance of completed systems and structures to be in accordance with design requirements. Non-safety related systems and design features not included in Table 14.2-1 will be tested and/or placed into service in accordance with procedures which are appropriate for the installation. During the power ascension testing phase, power ascension tests, surveillance test instructions and other permanent plant tests and technical instructions will be performed to demonstrate satisfactory operation of systems. Regulatory guidance will be used for development of initial test program requirements as discussed in Section 14.2.7. Summaries of tests to be performed during the initial test program are provided in Section 14.2.12."

2. Revise the first sentence of the first paragraph of Section 14.2.3.1 to read, "Tests will be performed in accordance with approved procedures."

3. Replace the first and second paragraphs of Section 14.2.3.3 with the following:

   "An independent technical review of component test procedures by qualified personnel will be performed prior to approval by the Startup Manager. The Startup Manager may request additional review as he deems appropriate.

   Preoperational test procedures will be reviewed by personnel who are assigned to JTG member organizations and qualified for review of preoperational test procedures as described by Section 14.2.2.7. The Startup Manager may request additional review to be performed as he deems appropriate. Preoperational test procedures will be approved by the Startup Manager after recommendation for approval by the JTG."

4. Revise the first sentence of Section 14.2.3.4 to read, "Test procedures will be...."

5. Revise the first sentence of Section 14.2.3.5 to read, "Test procedure revisions will...."

6. Revise the second sentence of Section 14.2.3.5 to read, "Test procedure changes required during...."

7. Add the following sentence to the end of Section 14.2.4.2:

   "Appropriate component tests will be performed prior to the performance of preoperational tests."

8. Revise the first and second paragraphs of Section 14.2.4.7 to delete the term "safety-related".

9. Revise the first sentence of Section 14.2.10 to read, "Fuel loading will begin after review and approval of the results of tests summarized in Table 14.2-1."

10. Revise the title of Section 14.2.12.1 to read, "Preoperational Testing Phase" and revise the first sentence to read, "Test summaries for components, systems, structures, and design features included in the preoperational phase of the initial test program are provided in Table 14.2-1."

11. New test summaries have been added to Table 14.2-1 to address testing of the following non-safety related systems:

a. Condensate and Condenser Vacuum System
b. Feedwater System
c. Main Steam System
d. Circulating Water System
e. Steam Generator Blowdown System

e. For RG 1.68, Appendix A, Item 1.a.2.d, 1.d.2, 1.d.3, and 1.e.4, exception is taken regarding testing of pressure safety and relief valves for the reactor coolant system and the main steam system (Section 14.2.7.4.a(3)). This Section should be modified to commit to either 1) conduct inplace preoperational testing of Reactor Coolant System and Main Steam System power operated relief valves, 2) provide vendor data that substantiates proper performance of these valves under design conditions, or 3) reference current analysis that determines the proper performance of these valves under design conditions (e.g., analysis provided in Q/R 413.07 for current conditions).

Response:

Preoperational testing of the Main Steam System and Reactor Coolant System power operated relief (and safety) valves are described in preoperational test summaries, "Steam Generator Safety and Relief Valves" and "Pressurizer Safety and Relief Valves", provided in Table 14.2-1. The tests described, are considered to be appropriate for these components and to be in compliance with the intent of Regulatory Guide 1.68, Revision 2. Section 14.2.7.4.a (3) was included to provide clarification that inplace capacity tests of these valves will not be performed. Since exception is not taken to Regulatory Guide 1.68, the FSAR has been revised to delete Section 14.2.7.4.a (3).

f. For RG 1.68, Appendix A, Item 1.g.2, exception is taken regarding emergency A.C. power distribution system with minimum and maximum design voltage available (Section 14.2.7.4.a(4)). This Section should be modified to address the concerns of Branch Technical Position PSB-1 regarding verification of adequate undervoltage protection and the validity of analytical models for the safety related buses.

Response:

The following FSAR changes has been made to clarify the basis for the referenced exception and describe testing that will be performed to address concerns of Branch Technical Position PSB-1:

1. Replace Section 14.2.7.4.a(4) [new paragraph 14.2.7.4.a(2)] with the following:

"Emergency loads will not be tested with minimum and maximum design voltage available. Emergency loads will be tested to demonstrate satisfactory starting and operating characteristics with power supply voltage within the design operating range. Transformer taps will be adjusted to obtain optimum voltage levels from no-load to full load conditions. Tests will be performed to record operating parameters of the offsite grid, Class 1E 6.9Kv, 480 volt, and 120 volt vital power busses under no-load, steady state load, and transient conditions. Data will be obtained for the Class 1E train having the lowest analyzed voltage. The recorded information will be compared to engineering voltage calculations to validate the analytical models used."

2. Table 14.2-1 test summaries for the AC Power Distribution and Vital 120 Volt AC Power Systems have been revised to describe test requirements for the above tests.

g. For RG 1.68, Appendix A, Item 1.i.1, exception is taken regarding the Containment design overpressure structural tests for Unit 1 (Section 14.2.7.4.a(5)). The status of testing on Unit 2 is unclear. This Section should be modified to state that this testing will performed for Unit 2.

Response:

The FSAR has been revised to delete Section 14.2.7.4.a (5). The original intent was to clarify that WBN did not plan to repeat the Structural Integrity Test previously performed on Unit 1 containment. This position, however, is not an exception to RG 1.68, thus, paragraph 14.2.7.4.a (5) is not required.

h. For RG 1.68, Appendix A, Items 1.i.1, 1.m.1, 1.m.4, and 1.o.1, exceptions are taken based on testing already completed (Section 14.2.7.4.a(5), 4.a(8), and 4.a(9)). For such cases, the exceptions should verify that testing previously completed conforms to the applicable Regulatory Guidance with test results that satisfy acceptance criteria. Exceptions to performing such tests upon resumption of the ITP schedule are acceptable, however these exceptions should indicate that retesting will be performed as may be necessary for modifications performed since the test was completed that could impact the acceptability of the test results.

Response: The FSAR, Section 14.2.7, has been revised to delete subparagraphs 4.a(5), 4.a(8), and 4.a(9) as discussed in item 7.b and 7.g above. Any previously performed tests for which credit will be taken to satisfy a regulatory testing commitment will be evaluated for compliance with applicable regulatory guidance and test acceptance criteria. Test procedure deviations from regulatory requirements, unacceptable test results, and post-test modifications will be evaluated to determine retest requirements.

i. For RG 1.68, Appendix A, Item 5.a, exception is taken regarding power reactivity coefficient testing at 25%, 50%, 75%, and 100% to omit these tests based on previous plant core designs having validated analytical models used for design parameters and plant testing having assured that actual core designs agree with plant parameters (Section 14.2.7, 4.a(21)). This Section should be modified to state that power reactivity coefficients will be determined to be in accordance with design at the recommended power levels.

Response:

WBN continues to take exception to RG 1.68, Appendix A, subparagraph 5.a. The NRC staff expressed agreement in SER Supplement 3, that a proposed reduced power coefficient measurement is acceptable and that this test at 25%, 50%, and 75% is not required. WBN now also takes exception to the 100% power coefficient measurement. The basis for this exception is the fact that these tests were completely exempted from the test program at a similar recently licensed plant and that analytical predictions for this measurement have been previously verified at identical plants. This test was not performed during the recent initial startup of Comanche Peak Unit 1. The FSAR has been revised to provide additional justification for this exception. Section 14.2.7.4.a(21) [new paragraph 14.2.7.4.a(16)] will be revised to read as follows:

"Power reactivity coefficients will not be determined at 25%, 50%, 75%, and 100% power levels. The power coefficient is not directly measured but is inferred. The required measurement for the test is time consuming compared with the value of the data obtained. The measurement has been previously deleted at other plants based on inferred measurements at identical plants. WBN is identical to Sequoyah Units 1 & 2 and McGuire Units 1 & 2. The power coefficient (Doppler coefficient) was inferred and compared with design values in three of these four units. The comparison between the inferred measurements and design values was within acceptance criteria in all cases thus demonstrating the ability to analytically predict this design parameter."

j. For RG 1.68, Regulatory Position C.4, exception is taken regarding the lead time availability of approved preoperational and power ascension test procedures for satisfying FSAR commitments for regional NRC personnel (Section 14.2.7.4.b). The exception indicates that approved test procedures will be available approximately 30 days prior to their intended use as opposed to the 60 days recommended. In addition, Section 14.2.11 was changed to state that approved preoperational and power ascension test procedures for satisfying FSAR testing commitments will be made available to NRC regional personnel approximately 30 days prior to their intended use. Sections 14.2.7 and 14.2.11 should be modified to state that approved preoperational and power ascension test procedures will be available for NRC review approximately 60 days prior to their intended use and not less than 60 days prior to the scheduled fuel loading date.

Response:

The FSAR, Sections 14.2.7 and 14.2.11 has been revised as follows:

1. Revise paragraph 14.2.7.4.b to read as follows:

" 14.2.7.4.b Regulatory Position C.4

Exception is taken to guidance related to providing approved test procedures to NRC staff personnel 60 days prior to their intended use. In lieu of 60 days, approved preoperational test procedures for satisfying FSAR testing commitments will be made available for regional NRC personnel approximately 30 days prior to their intended use. Power ascension tests will be made available to the NRC 60 days prior to fuel load in accordance with Regulatory Position c.4. Safety Evaluation Report (NUREG-0847 Supplement 3), January 1985, accepted a 30 day period for making approved preoperational test procedures available to the NRC."

2. Revise paragraph 14.2.11, fourth subparagraph, second sentence, to read as follows:

"Approved preoperational test procedures for satisfying FSAR testing commitments will be made available to NRC regional personnel a minimum of 30 days prior to their intended use. Power ascension test procedures will be made available 60 days prior to fuel load."

k. For RG 1.68.2, "Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants" no exceptions are taken to applicable RG guidance items (Section 14.2.7.5). The staff's review determined that the "Integrated Hot Functional Test" summary includes demonstration of the ability to cooldown the plant in a controlled manner from outside the main control room (auxiliary control room) and that the "Shutdown From Outside the Control Room Coincident With Loss of Offsite Power" summary includes demonstration that the unit can be taken to and maintained in the hot standby condition from outside the control room while experiencing a loss of offsite power. However, not all items of RG 1.68.2 could be identified. Either Section 14.2.7 should be modified to provide technical justification for exceptions to the following items, or existing test abstracts should be modified or additional test abstracts added regarding the following:

1. Describe the role of plant operators that remain in the control room during these tests (Regulatory Position C.2.c),

2. State that the minimum shift crew complement will be used during the hot standby demonstration (Regulatory Position C.3), and

3. State that the cold shutdown demonstration test will achieve approximately a 50 degree F reduction in reactor coolant temperature using the decay heat removal system (Regulatory Position C.4.d).

Response:

TVA considers the existing test summaries relating to demonstration of remote shutdown capability coupled with the unqualified commitment to full compliance with RG 1.68.2 are adequate to provide the needed assurance that remote shutdown capability will be demonstrated in compliance with regulatory guidance. TVA does not consider it necessary to quote regulatory guidance in the FSAR test summaries. This level of detail is required to be included in design output test scoping documents, issued and controlled by Nuclear Engineering, and individual test procedures. Test scoping documents provide detailed system test specifications that are necessary to satisfy Nuclear Engineering and regulatory test requirements and are used as a basis for preparation of individual preoperational and power ascension test procedures.

The above notwithstanding, the preoperational test summary "Integrated Hot Functional Testing" and the power ascension test summary "Shutdown From Outside the Control Room Coincident With Loss of Offsite Power" will be revised to reflect remote shutdown test guidance provided by RG 1.68.2.

1. For RG 1.79, "Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors" the only exception taken (Regulatory Position C.1.b.(2)) is regarding the recirculation test under cold conditions (Section 14.2.7.6). The staff was not able determine that ECCS flow from high pressure and low pressure pumps under hot operating conditions are included in the ITP in accordance with Regulatory Positions C.1.a.(2) and C.1.c.(3). Either Section 14.2.7 should be modified to provide technical justification for exception to these items, or the appropriate individual test summaries should be modified as necessary to include testing that addresses these items.

Response:

WBN intends to verify HPSI capability based on accident analysis and as-built pump and system head/capacity curves and verification of check valve operability as provided in RG 1.79, Regulatory Position C.1.a.2. The existing FSAR, Table 14.2-1, "Safety Injection System" test summary provides for these tests to be performed and are described in test method numbers 3, 4 and 6 for the injection mode. The check valve operability test at hot conditions for the core flooding requirements, Regulatory Position C.1.c.(3), is verified by test method number 3 for the accumulator tests. The test summary has been revised to clarify test prerequisites and methods for safety injection system test requirements under hot operating conditions.

m. For RG 1.108, "Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants" no exceptions are taken (Section 14.2.7, 8). The staff's review could not determine that the diesel generator test, or other tests, included several RG 1.108 items. Either Section 14.2.7 should be modified to provide technical justification for exceptions to the following items, or existing test abstracts should be modified or additional test abstracts added regarding the following:

1. Demonstration of the ability to (a) synchronize the diesel generator unit with offsite power while the unit is connected to the emergency load, (b) transfer this load to the offsite power, (c) isolate the diesel generator unit, and (d) restore it to standby status (Regulatory Position C.2.(6)),

2. Conduct of 69 consecutive valid tests (per plant) with no failures, with a minimum of 23 of 69/n tests, whichever is larger, per diesel generator unit (where n is the number of diesel generator units of the same design and size) (Regulatory Position C.2.(9)), and

3. Demonstration that load shedding includes the loss of the largest single load and a complete loss of load while maintaining minimum voltage requirements and not exceeding overspeed limits (Regulatory Position C.2.(4)).

Response:

The "Diesel Generators" preoperational test summary provided in Table 14.2-1 includes a test method for performing repetitive starts of the diesel generator units (test method 8) and a test method to perform load rejection test with verification of proper voltage and frequency control (test method 7). Although the test summary does not include specific discussion of diesel generator synchronization and transfer of emergency loads to offsite power followed by isolation and placing the diesel generator in standby, this test is required. TVA considers the existing test summary coupled with the unqualified commitment to full compliance with RG 1.108 is adequate and provides assurance that the diesel generators will be tested in compliance with regulatory guidance. TVA does not consider it to be necessary to quote regulatory guidance in the FSAR test summaries. This level of detail is required to be included in design output documents, referred to as Test Scoping Documents,

issued and controlled by Nuclear Engineering. Notwithstanding, the Diesel Generator preoperational test summary will be revised to clarify diesel generator repetitive start and load shedding test methods and to include emergency load transfer test requirements reflecting guidance provided by RG 1.108.

8. Section 14.2.11, "Test Program Schedule", was rewritten describing the testing sequence and progression. This change includes a statement that detailed schedules for testing will be reviewed to assure that tests were properly sequenced to provide assurance that untested safety features are not relied upon for safe operation of the plant. This Section states that plant structures, systems, and components which are relied upon to prevent or mitigate consequences of postulated accidents will be fully tested to the extent practical prior to exceeding 50 percent power level. Section 14.2.11 should be modified to make allowance, only when no reasonable alternative exists, for the potential need to proceed into low power testing up to the 25 percent power testing plateau, prior to completing testing of structures, systems, and components, which are relied upon to prevent or mitigate consequences of postulated accidents. Allowing reliance on structures, systems, and components up to the 50 percent power level, if prior testing is not practical, is contrary to the intent of the schedule review to assure that tests are sequenced such that untested safety features are not relied upon for safe operation of the plant.

Response:

Revise the last sentence of Section 14.2.11 to read as follows:

" Plant structures, systems, and components which are relied upon to prevent or mitigate consequences of postulated accidents will be fully tested to the extent practical prior to exceeding the five percent power level. However, those testing activities which cannot reasonably be performed below the five percent power level will be fully tested to the extent practical prior to exceeding the 30 percent power level with the exception of the RCS Flow Measurement test which is performed at the 50 percent power level consistent with Westinghouse scoping documents."

9. The Power Ascension Test Program test summaries of Table 14.2-2 provide insufficient detail for test prerequisites and test methods. Table 14.2-2 test abstracts and/or Subsection 14.2.3.4, "Format of Test Procedures" should be modified such that prerequisites address system initial conditions, including configuration, components that should or should not be operating, and other pertinent conditions that might affect the operation of the system.

Response:

Test summaries provided by Table 14.2-2 will be revised at a later date to provide additional detail for test prerequisites and test methods.

10. Several individual test summaries provided in Table 14.2-1, "Preoperational Test Summaries", and Table 14.2-2, "Power Ascension Test Program" include imprecise acceptance criteria (e.g., acceptable, adequate, proven, normal, design, proper, specified, within limits, required, accurate, correct, successful, satisfactory, appropriate). Acceptable criteria includes specific references to regulatory guides, Technical Specifications, assumptions used in the safety analysis, other FSAR Sections, and applicable codes and standards. Individual test summaries should be modified to specify the bases for determining acceptable system and component performance. Section 14.2.12 and/or Section 14.2.3.4 should also be modified such that acceptance criteria account for measurement errors and uncertainties.

Response:

Detailed test acceptance criteria are required to be included in design output documents which are issued and controlled by Nuclear Engineering. These documents provide detailed system test specifications that are necessary to satisfy Nuclear Engineering and regulatory test requirements and are used as a basis for preparation of individual preoperational test procedures which are provided to the NRC prior to their use. The test summaries of Table 14.2-1 and 14.2-2 will be revised to include appropriate references to acceptance criteria source documents such as sections of the FSAR, technical specifications, vendor documents, design documents.

11. The individual test summaries do not provide sufficient detail with respect to all test descriptions for all elements of the applicable Regulatory Guides to enable the staff to determine the adequacy of the WBN FSAR commitments. An evaluation of the test summaries regarding coverage of system specific test requirements will be made upon modification of the individual test summaries in response to the above staff comments and requests for additional information.

Response:

Response to other items of this request for additional information have made significant changes to the test summaries provided in Table 14.2-1. These changes have included the addition of several test summaries and revision of others to include or clarify initial test program testing commitments. Additionally, the acceptance criteria for several test summaries have been revised to enhance the level of detail and provide direct reference to appropriate source documents (FSAR, design documents, etc.) normally used for preparation of detailed test procedures. TVA considers these test summary changes coupled with responses provided to other items of this request to provide the necessary level of detail required.

As committed in response to Question 9, significant changes are also planned for the Power Ascension test summaries provided in Table 14.2-2.

The following are staff prepared ERRATA information which should be used by WBN to correct the FSAR Chapter 14 submittal.

Section	Page	Comments
14.2.7.4.a.(3)	14-17	Item 1.e.r should be 1.e.4
		First paragraph, last sentence "intention to performing" should be "intention to perform"
		Second paragraph, last sentence "mainstream" should be "mainsteam"

Response:

Paragraph 14.2.7.4.a.(3) was entirely deleted in response to item 7.e above.

PART 2

1. FSAR 14.2.7.4.a (2) Acceptance tests are planned to be performed for certain RG 1.68 systems/ components.

Comment: Since these systems/components are specified by RG 1.68, then the licensee should be informed that all designated acceptance tests should be completed and the results of such tests evaluated and approved by the licensee prior to issuance of operating license.

Response: As discussed in response to NRC Part 1 questions number 1 and 7d, acceptance tests for major non-safety related systems used for shutdown and cooldown of the reactor under normal plant conditions have been upgraded to preoperational tests and their test summaries added to Table 14.2-1. These tests will be completed and results approved prior to commencing fuel load.

R.G. 1.68 Appendix A

RG 1.68 Appendix A lists systems, components, and structures that should undergo preoperational testing. A review of RG 1.68 Appendix A, paragraph a through o, was performed and evaluated to the specific tests identified in FSAR Table 14.2-1, Test Summaries.

To confirm that RG 1.68 requirements are being addressed, our comments will require the licensee to respond to: (1) clarify what test summary tests the system, component, structure; or (2) address whether applicable to Watts Bar; or (3) correct/provide additional test summaries as appropriate.

1.a Reactor Coolant System

(2) (j) Jet Pumps:

Should state not applicable.

Response: Jet pumps are not included as a WBN design feature.

1.b Reactivity Control Systems

(1) Control Rod System Tests:

A test summary is not provided for this system. A preoperational test is normally conducted to ensure that the rod control system is ready to support core loading and further rod testing.

The rod control system should not delay a smooth transition through the modes (6, 5, etc.). (See Vogtle, Harris, Catawba preop programs where as much of the rod control system as possible was tested prior to core loading.)

Response: Component tests will be performed to ensure proper installation, calibration and function of Rod Control System equipment prior to fuel load. Proper operation of the total Rod Control System will be demonstrated during and after fuel load during the Power Ascension test phase as described by the Rod Control System test summary in Table 14.2-2. This approach is consistent with the NSSS vendor's test specification for the system.

(3) Standby Liquid Control System Tests:

Should state not applicable.

Response: A Standby Liquid Control System is not included in the WBN design.

1.d Residual or Decay Heat Removal Systems

(2) Steam Line Atmospheric Dump Valves:

Not clearly identified in a test summary. FSAR paragraph 14.2.7.4.a (2) does not list these components as receiving an acceptance test. Apply (1), (2), (3) above as appropriate.

Response: Preoperational tests of the steam line atmospheric dump valves (Steam Generator Power Operated Relief Valves) are described in the Test Summary "Steam Generator Safety and Relief Valves" provided in Table 14.2-1.

1.f Waste Heat Rejection Systems

(3) Raw Water and Service Water System:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Table 14.2-1 has been revised to add a test summary for the Condenser Circulating Water System as discussed in response to Part 1, item 7.d. Testing of safety related service water systems is addressed in the existing Essential Service Water System test summary. Testing of non safety related service water systems will be accomplished through normal component and acceptance testing.

1.h Engineered Safety Features

(2) Autodepressurization System:

Should state not applicable.

Response: A Autodepressurization System is not included in the WBN design.

(5) Cold Water Interlocks:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Cold Water Interlocks are not included as a WBN design feature.

(10) Ultimate Heat Sink:

Response: The ultimate heat sink for WBN is the Tennessee River. No preoperational tests are planned.

1.i Primary and Secondary Containments

(7) MN Steam Line Leakage Sealing System:

Should state not applicable.

Response: A Main Steam Line Leakage Sealing System is not included in the WBN design.

(11) Containment Supplementary Leak Collection and Exhaust System Tests:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: A Containment Supplementary Leak Collection and Exhaust System is not included in the WBN design.

(13) Containment Inerting System Tests:

Should state not applicable.

Response: A Containment Inerting System is not included in the WBN design.

(14) STBY Gas Treatment System Tests:

Should state not applicable.

Response: Testing of standby gas treatment systems is included in the Secondary Containment System Ventilation test summary.

(15) Containment Penetration Pressurization System Tests:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: A containment penetration pressurization system is not included in the WBN design.

(19) Bypass Leakage Tests on Pressure Suppression Containment:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Pressure suppression containment is not included in the WBN design. Gross bypass leakage of the ice condenser containment is tested in the containment ventilation test.

(21) Containment Penetration Cooling System Tests:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: A containment penetration cooling system is not included in the WBN design.

1.j Instrumentation and Control Systems

(4) Recirculation Flow Control System

Should state not applicable.

Response: Recirculation Flow Control is not included as a WBN design feature.

(7) ECCS Leak Detection System:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: See response to Part 1, item 7.c (1.j.7), Page 14.

(9) Pressure Control System Maintain D/P Across Boundary Valves:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Pressure control systems used to maintain differential pressure across boundary valves are not included in the WBN design.

(12) Failed Fuel Detection System:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: **Testing of the failed fuel detector is included in the test summary for the Process Radiation Monitoring System under test method 3. However, plans are underway to abandon the system in which case testing will not be applicable.**

(19) I/C for Shutdown Outside Control Room:

Licensee should address these prerequisites of RG 1.68.2 in a test summary. "Integrated Hot Functions", Table 14.2-1, Sheet 60, discusses cooldown outside control room.

Response: **The "Integrated Hot Functional Tests" summary has been revised as described by Part 1, item 7.k. This revision addresses test prerequisites of RG 1.68.2.**

(20) Instruments to Detect Flooding:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: **FSAR Table 14.2-1 sheet 10 Liquid Waste Drains, Collection and Transfer Facilities Test Summary has been revised to clarify testing of the station drainage water level detection system which includes sump level and flood detection controls and alarms.**

(21) Reactor Mode Switch:
Should state not applicable.

Response: **A Reactor Mode switch is not included as a WBN design feature.**

(22) Various Instruments Used to Track Postulated Accidents

FSAR 14.2.7.4.a (2) provides an acceptance test for "Meteorological Instrument." None of the other instruments (e.g., cont wide range pressure, reactor vessel water level, etc.) are clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: FSAR Section 14.2.7.4.a(2) has been deleted as discussed in response to Part 1 request item 7.b. The following instruments, used to track postulated accidents, are included in the Test Summaries indicated:

a. Reactor Vessel Level - Inadequate Core Cooling Monitor

b. Containment Pressure - Reactor Pressure Boundary Leak Detection

c. Containment Temperature - Reactor Pressure Boundary Leak Detection

d. Containment Humidity - Reactor Pressure Boundary Leak Detection

e. Containment Radiation Monitoring - Area Radiation Monitoring

f. Containment Sump Level - Reactor Pressure Boundary Leak Detection

g. Containment Hydrogen - Combustible Gas Control

The Meteorological instrumentation was placed into operation in May 1973. Since initial operation, the facility has been maintained, serviced and calibrated by qualified station personnel. The system components are included in the instrumentation maintenance and calibration program. Therefore, a preoperational test of the system will not be performed. Refer to response for item 7.b, Part 1.

(24) Annunciators for Reactor Control and ESF:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: In most cases, annunciators will be tested in conjunction with the applicable system which causes annunciator actuation. In the case of ESF annunciation, annunciators which will be actuated during this test will be tested with the systems affected by ESF actuation signal. Annunciators not tested with the applicable system preoperational test will included in the annunciator system test procedure.

1.k Radiation Protection Systems

(2) Personnel Monitors, Rad Survey Instrument Tests:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Exception is taken to performance of a preoperational test in accordance with RG 1.68, Revision 2, as discussed in FSAR Section 14.2.7.4.a (6) [new section 14.2.7.4.a(3)].

(3) Laboratory Equipment Checkout Appropriate Tests:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Exception is taken to performance of a preoperational test in accordance with RG 1.68, Revision 2, as discussed in FSAR Section 14.2.7.4.a (6) [new section 14.2.7.4.a(3)].

1.1 Radioactive Waste Handling and Storage Systems

(4) Isolation Features Steam Generator Blowdown:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Table 14.2-1 has been revised to include a test summary for the Steam Generator Blowdown system.

(5) Isolation Features Condenser Off-Gas:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: **Condenser off-gas isolation features has been incorporated into the Condensate System test summary in FSAR Table 14.2-1. Refer to response to Part 1, item 7.d.**

(6) Isolation Features Ventilation Systems:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Isolation features will be tested with each ventilation system (e.g. Control Room Ventilation, Auxiliary Building Ventilation, etc.) having automatic isolation capabilities. The existing test summaries for these systems require test of isolation features.

(7) Isolation Features Liquid Radwaste Effluent:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: **FSAR Table 14.2-1 sheet 24 Liquid Waste Processing Test Summary has been revised to include tests of effluent isolation functions.**

1.n Auxiliary and Miscellaneous Systems

(8) Seal Water Systems:

CVCS test summary (Table 14.2-1, Sheet 16) identifies reactor pump seals. Other sealing systems not clearly identified in a test summary. Apply (1), (2), (3) as appropriate.

Response: The WBN design includes the Gland Seal Water System and the Injection Water System which supply sealing water to non-safety-related components in the condensate, feedwater, and condenser vacuum systems. Proper operation of these systems will be demonstrated on a component basis prerequisite to the Condensate and Feedwater System Preoperational Tests. A test summary of the Condensate and Feedwater System Preoperational Tests are provided in response to Part 1, item 7.d.

(9) Vent and Drain Systems:

Liquid waste drains, collection, transfer test summary (Table 14.2-1, Sheet 10). Not clearly identified in a test summary are the diesel generator building, areas housing essential electrical equipment and essential pumps.

Response: **FSAR Table 14.2-1, sheet 10, Liquid Waste Drains, Collection, and Transfer Facilities Test Summary has been revised to include the Control and Diesel Generator Buildings. The areas housing essential electrical equipment and essential pumps (ECCS) are encompassed in the areas currently identified in the test summary.**

(15) Shield Cooling Systems:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: See Part 1, item 7.c (1.n.15)

(16) Cooling and Heating Systems for RWST:

Not clearly identified in a test summary. Apply (1), (2), (3) above as appropriate.

Response: Safety Injection System Test summary in Table 14.2-1 has been revised to test the RWST immersion heaters.

(17) Equipment/Controls for Subatmospheric Containment: Should state not applicable.

Response: A subatmospheric containment is not included in the WBN design.

(18) Heat Tracing Protection System:

FSAR 14.2.7.4.a (2) indicates that heat tracing will be handled by an acceptance test. A specific test summary should be identified for safety related equipment and systems. Apply (3) above.

Response: Test summaries for safety related systems which use heat tracing to maintain design temperature or freeze protection, have been modified to include heat tracing test requirements.

FSAR Table 14.2.-1 (Sheets 38, 39) Diesel Generator Test Summary

Test Method Item 8: The start and load tests of the diesel generator during reliability testing should not be done from "cold ambient conditions". These tests should be from standby condition of the diesel keepwarm system for lube oil and water. See RG 1.108, Revision 1, August 1977, paragraph C.1.b.

Response: The intent of "cold ambient" was to assure that engine starts from a "hot" condition would not be counted as a "valid" reliability start. The Test Scoping Documents and corresponding preoperational test procedures will establish the specific initial conditions for reliability testing. The engine conditions required for valid reliability starts will be clarified as part of the test summary revision discussed in response to Part 1, item 7.m.

ENCLOSURE 2

PROPOSED FSAR CHAPTER 14 PREOPERATIONAL TEST ABSTRACTS

ENCLOSURE 2

TABLE 14.2-1 TEST SUMMARY ADDITIONS AND REVISIONS

Revised Test Summaries:

Essential Raw Cooling Water System
Primary Makeup Water System
Component Cooling Water System
Process Sampling System
Post Accident Sampling System
Liquid Waste Drain, Collection and Transfer System
Fire Protection System
Spent Fuel Pool Cooling System
Residual Heat Removal System
Chemical and Volume Control System
Flood Mode Boration
Boron Recycle System
Safety Injection System
Containment Spray System
Integrated Engineered Safety Features System Actuation
Liquid Waste Processing System
Solid Waste Processing System
Gas Waste Processing System
Process and Effluent Radiation Monitoring System
Area Radiation Monitoring System
Control Building Ventilation System
Auxiliary Building Ventilation and Post Accident Sampling Environmental Control System
Containment Ventilation System
Combustible Gas Control System
Secondary Containment Ventilation System
Diesel Generator Building Ventilation System
Diesel Generators
AC Power Distribution System
DC Power Distribution System
Vital 120V AC Power System
Emergency Lighting System
Communication System
Reactor Protection System
Reactor Pressure Boundary Leakage Detection System
Excore Nuclear Instrumentation System
Seismic Instrumentation System
Steam Generator Safety and Atmospheric Relief Valves
Main Steam and Feedwater Isolation Valves
Auxiliary Feedwater System
Fuel Handling and Vessel Servicing Equipment
Reactor Coolant System Cold Hydrostatic Test
Integrated Hot Functional Tests
Operational Vibration Testing
Containment Integrated Leak Rate Test

ENCLOSURE 2

TABLE 14.2-1 TEST SUMMARY ADDITIONS AND REVISIONS

Revised Test Summaries: (cont'd)

Containment Isolation
Compressed Air System
Ice Condenser
Pressurizer Safety and Relief Valves
Intake Pump Station Ventilation

New Test Summaries:

Steam Generator Blowdown System
Main Steam System
Feedwater System
Condensate and Condenser Vacuum System
Circulating Water System

ESSENTIAL RAW COOLING WATER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of each train of the Essential Raw Cooling Water to supply required cooling water flow to assigned loads in all modes of operation.

PREREQUISITES

1. Verify system is configured as needed for unit/plant operation.

2. Intake channel from the river is open to supply water.

3. AC and DC electrical power supplies are available.

4. Control air supply is available.

TEST METHOD

1. Verify manual and automatic operation of ERCW pumps, strainers and valves.

2. Verify proper operation of pressure controllers.

3. Check for proper functioning of instrumentation, alarms, freeze protection, and interlocks.

4. Confirm that the isolation valves will properly respond to an isolation signal.

5. Verify proper system flow balancing and ERCW pump hydraulic performance.

6. Demonstrate manual and automatic operation of traveling screens and screen wash pumps.

7. Verify pump and valve time response meets design requirements.

8. Verify proper assignment of train related equipment and proper operation independent of other trains.

ESSENTIAL RAW COOLING WATER SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. Essential raw cooling water flow through system loads, where measurable with installed instrumentation, meets the design requirements described in FSAR section 9.2.1 and appropriate design documents.

2. Manual and automatic controls, interlocks, alarms, freeze protection, and instrumentation function in accordance with design drawings and as described in FSAR section 9.2.1 and 9.3.8.

3. The hydraulic performance of the essential raw cooling water pumps meets or exceeds design requirements described in FSAR section 9.2.1 and applicable design documents.

4. Manual and automatic controls for the traveling water screens, screen wash pumps, and backwash strainers operate in accordance with FSAR section 9.2.1 and applicable design documents.

5. Train related equipment is assigned to the proper train and operates properly independent of the other trains.

PRIMARY MAKEUP WATER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Primary Makeup Water System to furnish demineralized water for use as reactor coolant.

PREREQUISITES

1. The applicable primary makeup water storage tank has been filled with demineralized water to a level adequate to perform the test.

2. Adequate preparations for receipt/disposal of water at distribution points.

TEST METHOD

1. Verify proper operation of the primary makeup water pumps and confirm their capability to supply reactor makeup water to all distribution points.

2. Demonstrate proper functioning of instrumentation, interlocks, and alarms.

ACCEPTANCE CRITERIA

1. The hydraulic performance of the primary makeup water pumps meets or exceeds performance characteristics described by applicable vendor documents.

2. Primary Makeup Water can be supplied to the all locations shown in design drawings.

3. Instrumentation, controls, annunciators and interlocks function properly in response to simulated or normal input signals in accordance with design documents.

COMPONENT COOLING WATER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of each train of the Component Cooling Water System to supply required cooling water flows to its associated safety-related loads for the subsystem associated with unit being tested. To demonstrate the capability of the system to respond and realign to the safety-related configuration.

PREREQUISITES

1. Essential Raw Water System is operational.

2. An acceptable water supply is available to component cooling water surge tanks.

3. Control air is available.

4. AC and DC electrical power supplies are available.

5. The system is filled and vented to support performance of the test.

6. System loads are available to receive flow.

TEST METHOD

1. Demonstrate all manual modes of operation including pump/loop combinations.

2. Verify automatic starting of the redundant CCS pump upon loss of CCS discharge pressure.

3. Demonstrate automatic isolation of the non-safety related loop from the rest of the subsystem, and isolation between the two safety-related loops.

4. Verify instrumentation, controls, alarms and interlocks operate per design.

5. Verify proper system flow balancing of the safety and non-safety-related loops and CCS pump Hydraulic Performance.

6. Verify proper assignment of train related equipment and proper operation independent of other trains.

COMPONENT COOLING WATER SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. The hydraulic performance of the component cooling water pumps meets or exceeds design requirements described in FSAR section 9.2.2 and applicable design documents.

2. Cooling water flow distribution to the non-safety related and safety related loads (normal alignment) is in accordance with design as described in FSAR section 9.2.2 and design documents.

3. Cooling water flow to safety related loads when non-safety related loads are isolated is in accordance with design as described in FSAR section 9.2.2 and design documents.

4. The seal leakage return pumps alternately operate to return seal leakage, collected in the seal leakage collection tank, to the surge tank.

5. The hydraulic performance of the thermal barrier booster pumps meets or exceeds design requirements described in FSAR section 9.2.2 and applicable design documents.

6. Manual and automatic controls including system isolation features, interlocks, alarms, and instrumentation function as described in FSAR section 9.2.2 and in accordance with design documents.

7. Isolation valve closure times meet or exceed design and Technical Specification requirements.

8. Train related equipment is assigned to the proper train and operates independent of the other train.

PROCESS SAMPLING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Process Sampling System to provide liquid and gas samples through the correct flow path from all sample points in the primary and secondary systems, and to determine sample line holdup times.

PREREQUISITES

1. Plant conditions are established as necessary to facilitate drawing of liquid and gas samples from the required sampling locations.
2. Necessary tanks and sampling devices are available for receiving sample effluent and relief valve discharge.
3. Cooling water is available to sample coolers as required.
4. AC and DC electrical power supplies are available.
5. Required instruments and analyzers are calibrated.
6. Sample hood ventilation systems are operational.

TEST METHOD

1. Demonstrate proper system operation with regard to flow paths, flow capacity, and mechanical operability.
2. Verify the operability of the sample coolers and pressure reducing and regulating equipment.
3. Verify operation of instrumentation, detector, interlocks, and alarms.
4. Demonstrate by flow rate vs line length that the sample line holdup time is within allowable limits.
5. Demonstrate adequacy of sampling procedures.
6. Establish required purge times.
7. Demonstrate isolation valves operate properly on receipt of isolation signal.

PROCESS SAMPLING SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. Instrumentation and controls including automatic isolation valves, interlocks, and alarms operate properly in response to simulated or normal operating inputs as described in FSAR section 9.3.2 and applicable design documents.

2. Sample line delay times are in accordance with FSAR section 9.3.2.3.

3. Samples can be satisfactorily collected from designated sample points described in FSAR section 9.3.2.2 and analyzed using normal plant sampling procedures.

4. Sample analyzers, sample selection valves, coolers and pressure regulating devices operate in accordance with FSAR section 9.3.2.

POST ACCIDENT SAMPLING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate that samples required under post accident conditions can be obtained, properly handled and analyzed in a safe and timely manner.

PREREQUISITES

1. Supporting systems are operational as required.

TEST METHOD

1. Demonstrate the ability to obtain samples from the reactor coolant system, containment sump and containment atmosphere and transport of the samples to a transfer station or onsite laboratory.

2. Demonstrate that waste liquids go back to containment or to the radwaste system and that gas sample can be disposed of properly.

3. Verify liquid sample panel and CASP carts/casks are operational.

ACCEPTANCE CRITERIA

1. Samples can be obtained from all sample locations and safely transported for onsite analysis or to a transfer point for offsite analysis and analyzed within the required timespan as described by FSAR section 9.3.2.6.

LIQUID WASTE DRAINS, COLLECTION AND TRANSFER FACILITIES
TEST SUMMARY

OBJECTIVE

Demonstrate the capability of the floor and equipment drains to direct drainage from areas housing safety related equipment, radioactive and potentially radioactive liquids, chemicals and oils to designated collection points for transfer to storage tanks or processing systems.

PREREQUISITES

1. Floor and equipment drain lines and sumps have been cleaned of construction debris and are capable of receiving and transferring liquids.

2. Drain collector tanks and associated transfer pumps are operable.

3. AC and DC electrical power supplies are available.

TEST METHOD

1. Deliver water to each floor and equipment drain and verify capability of the drains to remove the water.

2. Verify setpoints for sump levels and pump actuation.

3. Verify flood detection instrumentation and alarm actuation.

4. Verify ECCS room passive sump and alarm actuation.

ACCEPTANCE CRITERIA

1. All floor and equipment drains are clear of obstruction and direct waste liquids to the proper location.

2. RHR and CSP compartment drains transfer liquid waste at design flowrates as described in FSAR section 9.3.3.

3. Automatic controls, interlocks and alarms operate in accordance with design drawings.

4. Sump and/or drain pumps operate in accordance with design drawings to control sump or tank level as described in FSAR section 9.3.3.

5. Flood detection instrumentation and alarm operates as described in FSAR section 6.3.2.11.3.

FIRE PROTECTION SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the Fire Protection System, including its fire detection and fire suppression functions in accordance with design requirements.

PREREQUISITES

1. The Fire Protection System pumps, piping, controls and associated valves and dampers are operational.

2. Fire Protection and detection instrumentation is calibrated.

TEST METHOD

1. Verify the proper functioning of the fire detection devices to activate the automatic fire protection system, alert the appropriate control location, initiate fire alarms, and to activate automatic closure of fire dampers, as required.

2. Verify proper operation of the fire suppression system, and obtain flow rates through the underground loop and differential pressure across the strainers.

3. Demonstrate the automatic start feature of the Fire Protection System pumps.

4. Demonstrate the capability of the Fire Protection System and Pumps to supply water to required areas of the plant at design flow and pressure.

5. Verify system vibrations are within design limits.

6. Perform a pressurization test on each enclosure utilizing a CO_2 fire suppression system. Measure the air leakage to determine the CO_2 retention time for each supplied enclosure.

7. Demonstrate proper operation of system instrumentation, alarms, controls and interlocks.

8. Verify the Aqueous Film Forming Foam system proportioning equipment operates in accordance with design and vendor documents.

FIRE PROTECTION SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. The hydraulic performance of the High Pressure fire protection pumps meets or exceeds design requirements as described in FSAR section 9.5.1.

2. The automatic fire detection system provides indication, annunciation and suppression system actuation outputs in accordance with design documents as described in FSAR section 9.5.1.

3. The Fire Protection System automatic and manual controls, interlocks, alarms, and instrumentation operate properly and in accordance with design drawings.

4. Carbon dioxide and Aqueous Film Forming Foam (AFFF) suppression systems operate properly and in accordance with vendor documents as described in FSAR section 9.5.1.

SPENT FUEL POOL COOLING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Spent Fuel Pool Cooling System to provide required cooling water flows to the spent fuel pool and verify proper operation of the purification loops and skimmers.

PREREQUISITES

1. The Spent Fuel Pool System is filled with demineralized or borated water as required for portions of the test.

2. Spent fuel pool cooling and skimmer system filters and strainers are installed and demineralizer has been loaded as required for portions of the test.

3. Refueling water purification filters are installed as required for portions of the test.

TEST METHOD

1. Verify proper operation and actuation of pumps and valves in all operational modes and verify correct flows in the spent fuel pool cooling loops including:

   - the ability to fill and empty the spent fuel pit (SFP), transfer canal, full cask area, and refueling cavity.
   - the recirculation capabilities using the refueling water purification pumps.

2. Verify correct cooling water flows to the heat exchangers.

3. Verify proper operation and actuation of pumps and valves in the spent fuel pool cleanup loop, and verify flow through the filters and demineralizers.

4. Verify proper actuation and operation of the pump and skimmers in the spent fuel pool skimmer loop and verify correct flows in the loop.

5. Check operation of instrumentation, interlocks, and alarms.

6. Verify no vortexing occurs during various modes of operation.

7. Check the leaktightness of all spent fuel pool and refueling canal gates and isolation devices.

8. Install prefabricated spool pieces as required for flood mode operation.

SPENT FUEL POOL COOLING SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. The hydraulic performance of the spent fuel pool cooling pumps meets or exceeds the design requirements as described in FSAR section 9.1.3.

2. Vortexing in the spent fuel pool is not observed during normal system operation.

3. The spent fuel pool skimmer pumps and recirculation loops operate in accordance with design requirements as described in FSAR section 9.1.3.

4. The spent fuel pool and refueling canal sectionalizing gates leakage do not exceed design limits and the refueling canals can be de-watered with the spent fuel pool filled.

5. Automatic and manual controls, interlocks, and alarms operate in accordance with design drawings.

6. All system flood mode preparations can be made in accordance with design requirements as described in FSAR section 2.4.14.

RESIDUAL HEAT REMOVAL SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the Residual Heat Removal (RHR) System and its capability to provide recirculation flows required to remove heat from the Reactor Coolant System (RCS).

PREREQUISITES

1. The RCS is filled with water for portions of the test, as required.

2. The RWST is filled with water as required to perform tests.

3. Hot functional testing is in progress or the RCS is hot as required to demonstrate RHR cooldown capability.

TEST METHOD

1. Verify the logic, controls, and interlocks associated with the valves in the RHR system.

2. Demonstrate acceptable pump performance while operating on the miniflow bypass line with the discharge isolation valves closed.

3. Demonstrate recirculation capability within the isolated RHR.

4. Demonstrate RHR operation during heatup with letdown from the RHR system through the chemical and volume control system.

5. Demonstrate RHR operation during plant cooldown following hot functional testing.

6. Verify proper operation of alarms, controls, and interlocks.

NOTE: Safety injection functions of RHR system will be demonstrated during testing of Safety Injection System.

ACCEPTANCE CRITERIA

1. The hydraulic performance of the RHR pumps meets or exceeds design requirements as described in FSAR section 5.5.7.

2. Automatic and manual controls, interlocks, and alarms operate in accordance with design drawings.

3. The RHR system provides low pressure letdown and heat removal for RCS cooldown in accordance with design requirements as described in FSAR section 5.5.7.

CHEMICAL AND VOLUME CONTROL SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the Chemical and Volume Control System (CVCS), including the capability to maintain charging and letdown flows, to maintain seal-water injection flow to the reactor coolant pumps, to maintain water chemistry conditions, to provide reactor makeup control, and to adjust reactor coolant boron concentration.

PREREQUISITES

1. Applicable portions of the Reactor Coolant System are capable of operationally interfacing with the Chemical and Volume Control System as required.

2. A cooling water supply is available for the heat exchangers as necessary for test performance.

3. Systems required to supply cover gas to the Volume Control Tank (VCT) are operational, and adequate supplies of gas are available.

TEST METHOD

1. Verify proper functioning of charging and letdown system components, including the hydraulic performance of the charging pumps, and operability of heat exchangers, letdown orifices, and control valves.

2. Demonstrate the capability to maintain seal water flow to the reactor coolant pumps.

3. Verify proper flows and pressure drops for seal injection and reactor coolant filters.

4. Verify proper operation of the volume control tank level and pressure control, including testing of the automatic makeup, dilution, alternate dilute, borate, and manual modes of reactor makeup control and cover gas system.

5. Check proper operation of instrumentation, interlocks, heat tracing, and alarms.

6. Verify proper operation of pumps and valves in the boric acid subsystem.

CHEMICAL AND VOLUME CONTROL SYSTEM
TEST SUMMARY

TEST METHOD (continued)

7. Demonstrate the chemical control function of the CVCS by verifying the capability of the system to introduce chemicals into the charging flow for pH and oxygen control, and that the system is capable of maintaining a gas pressure in the volume control tank as required during the applicable modes of operation.

8. Verify proper flows to mixed bed demineralizers, and determine pressure drops and effectiveness of demineralizers and filters.

9. Verify that a solution of boric acid can be mixed, transferred, recirculated and stored.

10 Verify that boric acid can be transferred to other systems as required.

ACCEPTANCE CRITERIA

1. The hydraulic performance of the charging pumps meets or exceeds design requirements as described in FSAR section 9.3.4.

2. Charging and letdown normal and alternate flowpaths including heat exchangers, letdown orifices, and control valves operate in accordance with design requirements as described in FSAR section 9.3.4.

3. Automatic and manual controls including chemical and automatic reactor makeup water control, interlocks, and alarms operate in accordance with design drawings.

4. Boric acid can be batched, stored and transferred in accordance with design requirements as described in FSAR section 9.3.4. Heat tracing functions as described in FSAR 9.3.8.

FLOOD MODE BORATION
TEST SUMMARY

OBJECTIVE

To demonstrate that the Auxiliary Charging equipment is capable of supplying makeup water flow to the Reactor Coolant System as required during flood mode operations.

PREREQUISITES

1. All necessary support systems are operational as required.
2. All equipment required for flood mode preparation is available.
3. Auxiliary Charging filters are installed and demineralizer loaded.

TEST METHOD

1. Verify proper operation of instrumentation, alarms and interlocks.
2. Demonstrate the equipment's ability to provide required flow to the Reactor Coolant System from the various makeup water sources.
3. Install all equipment required for flood mode operation.
4. Transfer makeup water from the preferred sources to the auxiliary makeup tank.
5. Connect fire hose between the High Pressure Fire Protection System and the auxiliary makeup tank. (Fire water is not to be introduced into the tank).

ACCEPTANCE CRITERIA

1. The hydraulic performance of the auxiliary charging pumps meets or exceeds design requirements as described in FSAR section 9.3.6.
2. Equipment required for flood mode operation can be properly installed.
3. All automatic controls, interlocks and alarms function in accordance with design drawings.

BORON RECYCLE SYSTEM
TEST SUMMARY

OBJECTIVE

Demonstrate the operability of the Boron Recycle System.

PREREQUISITES

1. The recycle evaporator of the Boron Recycle System, and other interrelated or supporting equipment, are operational as required.

2. A steam supply and cooling water supply are available for the evaporator packages as required.

TEST METHOD

1. Demonstrate the capability of the Boron Recycle System to collect water from its various designated sources.

2. Verify proper operation of system components, including the evaporator package and the feed, distillate and concentrates pumps.

3. Verify the proper operation of the piping heat tracing.

4. Check for operability of alarms and interlocks.

ACCEPTANCE CRITERIA

1. The Boron Recycle System components function in accordance with design and vendor documents as described in FSAR 9.3.7.

2. Flow paths are verified operational.

3. Heat tracing and other system related heating methods maintain system minimum temperatures in accordance with design documents.

4. Automatic controls, interlocks, and alarms operate properly in accordance with design drawings and vendor documents.

SAFETY INJECTION SYSTEM
TEST SUMMARY

OBJECTIVE

Demonstrate the ability of the centrifugal charging pumps, the safety injection pumps and Residual Heat Removal pumps to deliver required flows to the RCS during high-head injection and recirculation modes of operation.

Verify the discharge characteristics and proper system actuation for each of the SI accumulators.

Adjust flow to all SI branch lines for even flow distribution and total flow rate to prevent charging and safety injection pumps from exceeding runout conditions.

PREREQUISITES

1. The RCS is drained down and the reactor head and internals are removed as required for portions of system tests.

2. The RCS is at nominal operating pressure and temperature for the check valve operability portion of system tests.

3. A supply of nitrogen or compressed air is available for pressurizing the accumulators.

4. Demineralized water or borated water is available to fill the accumulators.

5. The Refueling Water Storage Tank (RWST) is filled with demineralized water or borated water at refueling concentration.

TEST METHOD

Injection Mode

1. Verify that all valves and components required for SIS operation are sequenced properly and are actuated within minimum required times.

2. With the RHR, centrifugal charging and safety injection pumps aligned to take suction from the RWST, sufficient data will be taken to ensure satisfactory operation in the miniflow mode.

<u>TEST METHOD</u> (continued)

3. With the reactor vessel head and internals removed, and the pumps taking suction from the RWST, perform full flow tests for each pump. Measure flow and discharge pressure and adjust system as necessary to ensure pumps do not exceed their maximum runout conditions. Measure flows in branch lines and adjust as necessary to ensure that flow distributions for all injection lines are within limits.

4. Align RHR and safety injection pumps to deliver to RCS hot legs. Measure and adjust flows as applicable.

5. Verify proper operation of controls, interlocks and alarms.

6. Verify the primary safety injection to reactor coolant loop check valves will open with the RCS at nominal operating pressure and temperature.

Accumulators

1. Each accumulator is partially pressurized and its discharge valve is then opened allowing discharge to the RCS. Level and pressure measurements are used to calculate line resistance.

2. Verify ability of the accumulator isolation valves to open automatically on a safety injection signal against a differential pressure equal to the accumulator at maximum operating pressure and the Reactor Coolant System depressurized.

3. Verify that the check valves in the accumulator discharge lines will open with the RCS in a hot condition.

4. Verify proper operation of controls, interlocks and alarms.

5. Verify operability of nitrogen fill, venting and relief valves, accumulator drains, and accumulator makeup system.

Recirculation Mode

1. Verify auto operation of RHR pump containment pump suction valves upon receipt of RWST lo-lo level signal.

SAFETY INJECTION SYSTEM
TEST SUMMARY

TEST METHOD (continued)

2. Align safety injection and centrifugal charging pumps to take suction from the discharge of the RHR pumps and deliver to the RCS cold legs with RHR taking suction from the RWST or the Reactor Coolant System hot leg. Measure flows and adjust as necessary to ensure that RHR pumps deliver adequate flow to safety injection and centrifugal charging pump suctions under runout conditions.

3. Verify proper operation of all controls and interlocks, RWST freeze protection immersion heaters and heat tracing, and alarms.

ACCEPTANCE CRITERIA

1. The hydraulic performance of the safety injection pumps meets or exceeds design requirements as described in FSAR section 6.3.

2. The flow rates and flow distribution for all branch lines are in accordance with design requirements.

3. Accumulator discharge performance is in accordance with design requirements as described in FSAR section 6.3.

4. Automatic and manual controls, interlocks and alarms function properly in response to normal or simulated input signals in accordance with design drawings. RWST freeze protection functions as described in FSAR section 9.3.8.

5. Primary SIS to RCS check valves will open with the RCS at nominal operating conditions.

6. The accumulator discharge isolation valves will open properly under maximum differential pressure conditions, RCS depressurized and accumulators at maximum pressure.

CONTAINMENT SPRAY SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the hydraulic performance of the containment spray pumps, proper function of the spray nozzles and headers and the proper operation and actuation of the system components.

PREREQUISITES

1. A water supply is available for the containment spray pumps.

2. An air supply is available for testing the Containment Spray and RHR spray nozzles.

3. The Containment Spray pumps discharge lines and the RHR spray lines are isolated to prevent spraying water into the Containment Building.

TEST METHOD

1. Through test connections, pass air under pressure to the containment spray and RHR spray nozzles and ring headers to ensure they are free of obstructions.

2. Operate the Containment Spray pumps through the Refueling Water Storage Tank (RWST) recirculation path to verify pump hydraulic performance.

3. Verify proper sequencing of valves and pumps in response to simulated safeguards actuation signals.

ACCEPTANCE CRITERIA

1. The hydraulic performance of the containment spray pumps meets or exceeds design requirements described in FSAR section 6.2.2.

2. Containment and RHR spray headers and nozzles are not obstructed.

3. Manual and automatic controls, interlocks, alarms, and instrumentation function as described in FSAR section 6.2.2 and applicable design documents.

INTEGRATED ENGINEERED SAFETY FEATURES SYSTEM ACTUATION TEST SUMMARY

OBJECTIVE

Demonstrate proper automatic actuation, alignment and operation of all ESF components controlled by the Engineered Safety Features Actuation System (ESFAS) with and without offsite power.

PREREQUISITES

1. The Reactor Coolant System (RCS) is cold and drained down and the reactor vessel head and internals are removed.

2. The Refueling Water Storage Tank has an adequate supply of water.

3. The Containment and RHR spray lines to containment are isolated to prevent spraying into the containment building. The containment sump has been isolated to prevent back filling.

4. Actuation circuitry has been tested and is capable of actuating all equipment upon manual ESFAS actuation.

5. All ESF systems and equipment required to actuate on a ESFAS signal are operational and are aligned for normal operation.

TEST METHOD

1. Conduct the ESF test under normal power conditions, one power train at a time (other power train completely deenergized) to demonstrate ESF train independence and redundance.

2. Verify the proper actuation, alignment and operation of all ESF equipment in response to the ESFAS signal.

3. Verify the ESF component position following reset of the ESFAS signal.

4. Verify all train-related ESF equipment operates correctly including emergency diesel start and load sequence, pump start times and valve actuation upon initiation and reset of an ESFAS signal coincident with a simulated station blackout.

INTEGRATED ENGINEERED SAFETY FEATURES SYSTEM
ACTUATION TEST SUMMARY

ACCEPTANCE CRITERIA

1. The ESF components operate and properly align in response to a ESFAS signal in accordance with design as described in FSAR section 7.3.1.

2. The diesel generators start and sequence loads when offsite power is not available as described in FSAR section 8.3.1.

3. Components actuated by a ESFAS signal remain in the actuated condition after reset of the initiating signal.

4. During single train actuation tests, all components function in accordance with the requirements of FSAR Section 7.3.1 with the opposite train remaining de-energized.

LIQUID WASTE PROCESSING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Liquid Waste Processing System to process liquid waste and transfer these wastes to their respective disposal points.

PREREQUISITES

1. All necessary supporting equipment is operational.

TEST METHOD

1. Demonstrate proper operation of all components in the system, including the waste holdup tanks and system demineralizers.

2. Verify the proper operation of the reactor coolant drain tank and associated equipment.

3. To demonstrate that the system pumps are capable of providing design flow rates.

4. To demonstrate that the system filters, strainer and demineralizer are capable of passing the required flow rate within the design pressure drop.

5. To verify the operability of the system instrumentation, controls, and interlocks including effluent isolation features and applicable alarms and setpoints associated with the liquid waste processing.

ACCEPTANCE CRITERIA

1. The system will process waste liquids from all assigned collection points through system filters and demineralizers to designated discharge and storage locations in accordance with design requirements as described in FSAR section 11.2.

2. Automatic and manual controls, interlocks including process effluent isolation, and alarms operate in accordance with design drawings and vendor documents.

SOLID WASTE PROCESSING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the solid waste systems to collect and prepare disposable dry active and wet active wastes.

PREREQUISITES

1. All necessary supporting systems are operational.

2. Associated pumps, piping, and controls are operable.

TEST METHOD

1. Demonstrate the ability to receive, hold and transfer spent resins and condensate waste evaporator bottoms from their source to the bulk disposal outlet.

2. Verify proper operation of associated instrumentation, interlocks and alarms.

ACCEPTANCE CRITERIA

1. Wet active waste can be collect, transferred, dewatered for shipment in accordance with design requirements as described in FSAR section 11.5.

2. Dry active wastes can be compacted for shipment in accordance with design requirements as described in FSAR section 11.5.

3. Automatic and manual controls, interlocks, and alarms operate in accordance with design drawings.

GASEOUS WASTE PROCESSING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the gaseous waste portion of the Waste Disposal System (WDS) to collect and store gases from various plant sources and discharge them to the environment in a controlled manner.

PREREQUISITES

1. The gaseous waste components, piping, all valves and instrumentation are available as required.

TEST METHOD

1. Demonstrate proper operation of the system and its components, including filling and isolation of the gas decay tanks, and waste gas compressor performance.

2. Check for proper functioning of controls, interlocks and alarms.

ACCEPTANCE CRITERIA

1. The performance of the waste gas compressors is in accordance with design requirements as described in FSAR section 11.3.

2. Automatic and manual controls, interlocks, and alarms operate in accordance with design drawings.

PROCESS AND EFFLUENT RADIATION MONITORING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Process and Effluent Radiation Monitoring System including the Gross Failed Fuel Detector to continuously monitor radiation levels of plant liquid and gaseous processes and effluent, record radiation levels, and initiate radiation alarm and isolation signals.

PREREQUISITES

1. A remotely operable check source is available for each radiation detector as required.

2. Electrical power is available at each radiation detector, control panel and associated equipment.

3. System leak tightness has been verified as applicable.

4. Calibration of detector instrumentation is complete including alarm setpoints using a radioactive calibration source.

5. Calibration at associated isokinetic sampling systems has been completed.

TEST METHOD

1. Verify operability of heat tracing and sample coolers.

2. Verify proper operation of associated isokinetic sampling systems.

3. Verify operation and response of the process and effluent radiation monitors including the gross failed fuel detector (GFFD) to the appropriate check sources including local and control room indicating and recording devices as applicable.

4. Verify the applicable alert, high radiation and circuit malfunction annunciators function properly.

5. Verify proper operation of interlock functions and devices.

6. Verify pump or fan operation, flow indication and control and proper valve operation.

PROCESS AND EFFLUENT RADIATION MONITORING SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. Liquid and gaseous monitors provide high radiation and instrument malfunction alarms and indication in accordance with design requirements as described in FSAR section 11.4.

2. Automatic interlocks operate in accordance with design drawings.

3. Sample flowrates are in accordance with design requirements and vendor documents.

4. Sample and recirculation pumps, indicators, and control valves operate in accordance with design drawings and vendor documents.

AREA RADIATION MONITORING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of area radiation and airborne radioactivity monitors to provide continuous surveillance of radiation levels throughout accessible areas of the plant site, alert personnel of excessive dose rate levels, and provide direct reading indication and/or recording of dose rates at local and/or central (Main Control Room) monitoring locations.

PREREQUISITES

1. Calibration of each monitor including detectors, indicators, recorders, alarm setpoints and indicating lights is complete.

2. A check source is available for each radiation detector as required.

3. Electrical power is available to each radiation detector, control panel and associated equipment.

TEST METHOD

1. Verify operation and response of the area and airborne radiation monitors with the appropriate check source, including local and control room indicating and recording functions.

2. Verify the applicable alert, high radiation level and malfunctions annunciators function properly.

3. Verify the operation of pumps, flow control instrumentation, and control valves for all airborne radioactivity monitors.

ACCEPTANCE CRITERIA

1. Area radiation and fixed airborne radioactivity monitors provide radiation indication and alarms in accordance with design requirements as described in FSAR section 12.3.4.

2. Sample pumps, indicators and control valves operate in accordance with design drawings and vendor documents.

CONTROL BUILDING VENTILATION SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Control Building Ventilation and Air Conditioning to maintain controlled atmospheric conditions within the building for equipment and personnel.

PREREQUISITE

1. Cooling water is available.
2. AC and DC electrical power supplies are available.
3. Compressed air is available for system component operation.
4. Building pressure boundary is complete as required to support testing.

TEST METHOD

1. Verify system capability to supply required air volume and air pressure per design.
2. Verify that redundant trains perform in accordance with design.
3. Verify that system instrumentation, interlocks, and alarms function in accordance with design.
4. Verify proper pressure differentials in rooms.
5. Verify the performance of the control room isolation, associated air handling unit operation, and emergency pressuring air fan operation.
6. Verify pressure integrity of system filter units and channeling does not occur.
7. Verify proper operation of emergency filter units in accordance with design requirements.
8. Verify maintenance of positive pressure in MCR with shutdown board room pressurizing supply fan running.
9. Verify proper switching of the redundant battery room exhaust fans upon failure of normally operating fan.

CONTROL BUILDING VENTILATION SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. Main Control Room HVAC maintains building temperatures, air flow, building differential pressures, and chilled water flow as described in FSAR section 9.4.1.

2. Control Building Emergency Air Cleanup System controls the release of contamination through HEPA filters and carbon absorbers, maintains air flow as described in FSAR section 9.4.1, and meets the requirements of ANSI N510.

3. Control Building Emergency Pressurization System maintains area pressure differentials and air flow requirements as described in FSAR section 9.4.1.

4. Battery Room Ventilation System maintains air flow requirements for proper ventilation of battery room atmosphere as described in FSAR section 9.4.1

5. Miscellaneous Ventilation Systems within the control building will provide ventilation, temperature control, and pressure differentials to dedicated areas as described in FSAR section 9.4.1. and design documents.

6. Manual and automatic controls, including isolation features, valve and damper closure times, interlocks, alarms, and instrumentation function in accordance with design documents.

AUXILIARY BUILDING VENTILATION SYSTEM AND
PASF - ENVIRONMENTAL CONTROL SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the proper operation of the Auxiliary Building HVAC systems and the Post Accident Sampling Facility (PASF) - Environmental Control System (PASFECS) including air handling units, fans, heaters, water chillers, circulating pumps, cooling coils, HEPA/charcoal filters and air flow.

PREREQUISITES

1. AC and DC electrical power supplies are available.

2. Cooling water is available to cooling coils and chillers.

3. Makeup water is available to Chilled Water System compression tank.

4. Pressure boundary seals are complete as required.

TEST METHOD

1. Demonstrate proper operation of the ventilation supply and exhaust fans, water chillers, circulating pumps, refrigerant condensing units, air handling units, HEPA and charcoal filters, and verify adequate air flow to areas served.

2. Demonstrate proper operation of the inlet and exhaust isolation dampers associated with equipment rooms.

3. Demonstrate proper operation of the heating/cooling units in the building equipment rooms.

4. Verify the system's ability to maintain proper building pressure differentials.

5. Verify the Post Accident Sampling Environmental Control System (PASFECS) HEPA and charcoal filter units satisfy air flow and pressure integrity requirements.

6. Ensure proper operation of instrumentation, interlocks, and alarms.

AUXILIARY BUILDING VENTILATION SYSTEM AND
PASF - ENVIRONMENTAL CONTROL SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. General Ventilation System supply and exhaust systems maintains building temperatures, air flow, building differential pressures, and chilled water flow as described in FSAR section 9.4.3.

2. Fuel Handling Building Exhaust system, in conjunction with Auxiliary Building General Ventilation System, maintains air flow as described in FSAR section 9.4.2.

3. Safety Features Equipment Room Coolers maintain area temperatures and air flow as described in FSAR section 9.4.5.3.

4. Post Accident Sampling Environmental Control System maintains atmospheric conditions to control the release of contamination through HEPA filters and carbon Absorbers. Maintains air flow as described in FSAR section 9.4.9 and meets the requirements of ANSI N510.

5. Shutdown Board Room Air Conditioning System maintains temperature, air flow, chilled water flow, and area pressure differentials as described in FSAR section 9.4.3.2.4.

6. Auxiliary Board Room HVAC Systems maintain temperature, air flow, area pressure differentials, as described in FSAR section 9.4.3.2.5.

7. Shutdown Transformer Room HVAC Systems maintain temperature, and air flow as described in FSAR section 9.4.3.2.6.

8. Manual and automatic controls, interlocks, auto start and isolation features, alarms, function in accordance with design documents.

CONTAINMENT VENTILATION SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Containment Ventilation System to provide air recirculation, proper cooling of upper and lower containment spaces, CRDM cooling, reactor vessel cavity and nozzle support cooling, and proper air purging and filtration.

PREREQUISITES

1. Cooling water is available for the air handling units.
2. Control air is available for valve and damper operation.
3. AC and DC electrical power supplies are available.
4. Access hatches, plugs, gates and shields are in their proper positions.

TEST METHOD

1. Verify the CRDM Cooling Units are capable of delivering design air flow.
2. Verify the Containment Purge Supply and Exhaust fans are capable of delivering design air flow capacities and filtration portions of system operate in accordance with design requirements.
3. Verify the Upper Compartment Cooling units deliver design air flow to all upper containment spaces and verify system will maintain upper containment spaces within design temperatures.
4. Verify the LOWER Compartment Cooling units deliver design air flow to all lower containment spaces. Verify system in conjunction with CRDM cooling, will maintain lower containment spaces within design temperatures.
5. Verify return air fans deliver design air flow and ice condenser doors open at design differential pressures.
6. Verify instrument room cooling system and associated chilled water equipment will deliver design air and water flow.
7. Operate all fans, dampers, and flow control equipment to demonstrate proper manual control and automatic response to start, stop and isolation input signals.

CONTAINMENT VENTILATION SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1. CRDM Cooling Units in conjunction with the Lower Compartment cooling units, will maintain design temperatures and airflows in the lower containment areas as described in FSAR section 9.4.7.

2. Containment Purge Supply and Exhaust System maintains containment atmospheric conditions to control release of contamination through HEPA and carbon adsorber beds, supply fresh air, and provides for isolation of airflow paths to primary containment as described in FSAR section 9.4.6. and meets the requirements of ANSI N510.

3. Upper Containment Cooling units will maintain design temperatures and air flows in the upper containment areas as described in FSAR section 9.4.7.

4. Lower Containment Cooling units in conjunction with CRDM Cooling units, will maintain design temperatures and air flows in the lower containment areas as described in FSAR section 9.4.7.

5. Air return fans will recirculate air, including that from the hydrogen collection ductwork system and discharge with sufficient capacity to force the air through the ice condenser bed system. Ice condenser doors open as described in FSAR section 6.7

6. Incore Instrument room cooling units and associated chilled water systems will maintain the Incore Instrument room environment at design temperatures and provide proper containment isolation as described in FSAR section 9.4.7.

7. Manual and automatic controls, including isolation features, interlocks, alarms, and instrumentation function as described in FSAR section 9.4.6 or 9.4.7 as applicable, and in accordance with design documents.

COMBUSTIBLE GAS CONTROL SYSTEMS
TEST SUMMARY

OBJECTIVE

To demonstrate the proper operation of the Hydrogen Recombiners, and Hydrogen Mitigation System (HMS) including the heaters, controllers, igniters, fans, and instrumentation.

To demonstrate the ability of the hydrogen sampling system to detect the presence of hydrogen in the primary containment atmosphere and give indication in the control room.

PREREQUISITES

1. Each igniter has been energized for the minimum required duration and allowed to cool prior to test conduct.

2. Containment Ventilation Systems are operational.

TEST METHOD

1. Verify design air flow through hydrogen recombiners and sample tubing.

2. Verify the hydrogen recombiner heatup rate and operating outlet temperature.

3. Verify sample system controls, interlocks, instrumentation, and alarms operation.

4. Demonstrate the hydrogen analyzer is capable of drawing and analyzing a sample and returning it to containment. Verify alarms and instrumentation function properly.

5. Energize each HMS igniter and verify the voltage and surface temperature.

ACCEPTANCE CRITERIA

1. The Hydrogen Recombiners will achieve and maintain operating temperature at design air flow at design power input as described in FSAR section 6.2.5.

2. The hydrogen analyzer system is capable of sampling and analyzing the containment atmosphere in accordance with design requirements as described in FSAR section 6.2.5.

3. All HMS igniters are operational with current and voltage readings comparable to previous test data in accordance with FSAR section 6.2.5.

ACCEPTANCE CRITERIA (continued)

4. Controls, interlocks, instrumentation, and alarms operate in accordance with FSAR section 6.2.5 and design drawings.

SECONDARY CONTAINMENT SYSTEM VENTILATION TEST SUMMARY

OBJECTIVE

The Secondary Containment System is comprised of the Shield Building of each reactor unit and that portion of the Auxiliary Building which serves as the Auxiliary Building Secondary Containment Enclosure (ABSCE). The Emergency Gas Treatment System (EGTS) is provided for ventilation control and cleanup of the atmosphere inside the annulus between the Shield Building and the Primary Containment Building of each reactor unit. The Auxiliary Building Gas Treatment System (ABGTS) provides a similar contamination control capability in the Auxiliary Building Secondary Containment Enclosure (ABSCE).

To demonstrate the ventilation systems will maintain building conditions that prevent potentially radioactive gases leaking from primary containment or auxiliary building secondary containment enclosure from directly reaching the outside environment.

PREREQUISITES

1. AC and DC electrical power supplies are available.

2. Compressed air is available.

3. Ventilation systems are sufficiently complete to support testing.

4. Building pressure boundary seals are complete.

TEST METHOD

1. Verify capability of the Emergency Gas Treatment System to maintain the correct air pressure at design-flow.

2. Verify that the air cleanup units of the Emergency Gas Treatment System are capable of processing annulus air (filtering, etc.) at design flow.

3. Verify that the HEPA filter units operate per design and that the charcoal filter units operate per design at rated flow.

4. Verify that the Auxiliary Building Gas Treatment System (ABGTS) fans and filter units maintain correct building pressure at design flow.

5. Verify that correct intra-building and inter-building differential pressures are maintained at design flow.

TEST METHOD (continued)

6. Verify that instrumentation, valve, damper and train separation interlocks operate per design.

7. Verify all setpoints, alarms, and indication.

8. Verify HEPA and charcoal filter units satisfy air flow and pressure integrity requirements.

9. Verify that secondary containment isolation occurs within a time period which meets design.

10 Verify that modulation dampers operate properly to maintain building pressure differentials within design limits.

ACCEPTANCE CRITERIA

1. Emergency Gas Treatment System (EGTS) maintains annulus atmospheric conditions to control the release of contamination through HEPA filters and carbon Absorbers. Maintains air flow and pressure differentials within the annulus area as described in FSAR section 6.2.3 and meets the requirements of ANSI N510.

2. Auxiliary Building Gas Treatment System (ABGTS) maintains auxiliary building atmospheric conditions to control the release of contamination through HEPA filters and carbon Absorbers. Maintains air flow and pressure differentials within the auxiliary building as described in FSAR section 6.2.3.1. and meets the requirements of ANSI N510.

3. Manual and automatic controls, including isolation features, valve and damper closure times, interlocks, alarms, and instrumentation function in accordance with design documents.

DIESEL GENERATOR BUILDING VENTILATION SYSTEM TEST SUMMARY

OBJECTIVE

To demonstrate that each of the diesel generator compartment ventilation fans and other diesel generator safety-related room fans will provide adequate ventilation for their associated diesel generator compartment and room.

PREREQUISITES

1. AC and DC electrical power supplies are available.

2. Control air is available.

TEST METHOD

1. Verify that the ventilation system exhaust fan starts automatically on receipt of a diesel generator start signal.

2. Verify adequate ventilation during Emergency Diesel Generator operations.

3. Check operation of instrumentation and alarms.

4. Verify that generator and electrical panel ventilation fans operate per design.

5. Verify that electric board room exhaust fans operate per design.

6. Verify that battery hood exhaust fan and its damper operate per design.

7. Verify adequate air flow is supplied to the 480V auxiliary board room of the Additional Diesel Generator Building in accordance with design requirements.

ACCEPTANCE CRITERIA

1. Diesel Generator Building Ventilation System maintains area temperatures and air flows as described in FSAR section 9.4.5.

2. Manual and automatic controls, interlocks, auto start features, alarms, function in accordance with design documents.

DIESEL GENERATORS
TEST SUMMARY

OBJECTIVE

To demonstrate the operability and reliability of the diesel generator units and associated auxiliaries including proper starting and load sequencing.

PREREQUISITES

1. DC and AC power is available for controls, alarms, protective relays, air starting solenoid valves and generator field flashing.

2. Compressed air is available for air starting of the diesel generator unit.

3. Fuel and Lubrication Oil Systems are available to support testing.

4. Cooling water is available and operational.

5. Diesel generator building ventilation is operational.

TEST METHOD

1. Verify proper performance of the diesel generator fuel oil storage and transfer system, cooling and heating systems, and the lubricating oil system.

2. Verify all engine alarms and interlocks are functional.

3. Demonstrate the capability of the unit to start manually and automatically as designed and attain the required voltage and frequency within the acceptable time limitation.

4. Demonstrate the diesel generator batteries and battery chargers operate per design.

5. Verify the operation of the starting air compressors and associated components. Demonstrate sufficient starting air capacity by starting a diesel generator 5 times from the associated set of starting air accumulators without recharging the accumulators.

6. Verify the capability of the diesel generator unit to accept the sequenced equipment by utilizing actual plant loads appropriate for existing plant conditions. The loads will be added at the proper sequence and time duration, while maintaining an acceptable voltage and frequency.

DIESEL GENERATORS
TEST SUMMARY

TEST METHOD (continued)

7. Demonstrate ability to synchronize each diesel generator unit with the offsite power source while the unit is loaded, transfer the load from the unit to the offsite source, isolate the diesel generator unit and place it in standby status.

8. Perform load rejection tests including loss of the largest single load and complete loss of load and verify proper voltage is maintained and overspeed limits are not exceeded.

9. Demonstrate diesel generator unit reliability by performing 69 valid tests per plant with no failures, with a minimum of 35 tests per diesel generator unit. Valid tests are defined in RG 1.108, Revision 1, Regulatory Position C.2.e.

10 Demonstrate loading capability for at least 24 hours, of which 22 hours will be a load equivalent to the diesel generator continuous rating and 2 hours will be a load equivalent to the diesel generator 2-hour rating. Calculate fuel consumption.

11 Reperform tests summarized in steps 3 and 6 above immediately after shutdown from the load test in step 10 to demonstrate functional capability at full load temperature conditions.

12 Demonstrate that no common failure modes exist by starting the redundant diesel generators simultaneously.

13 Demonstrate diesel generator capability to supply emergency load is not impaired during performance of periodic tests.

14 Align the additional diesel generator unit (ADGU) with each of the existing diesel generator units (EDGU) and start the unit to demonstrate proper connection of controls and operation of the ADGU and auxiliaries.

ACCEPTANCE CRITERIA

1. Each diesel generator will automatically and manually (local and remote) start and achieve rated speed and voltage within the time required after receiving a signal to start as described in FSAR section 8.3.1.

DIESEL GENERATORS
TEST SUMMARY

ACCEPTANCE CRITERIA (continued)

2. Each diesel generator will be successfully started from a ambient standby condition, loaded to a minimum of 50 percent load, and operated for one hour a minimum of 35 consecutive times without failure as defined by RG 1.108, Revision 1, Regulatory Position C.2.e.

3. Both diesels start and operate satisfactorily upon receiving simultaneous start signals. The starting air system capacity is sufficient to start the diesel generator 5 times as described in FSAR section 9.5.6.

4. Each diesel generator will start and achieve rated speed and voltage within the required time and accept the sequenced load when restarted from a hot condition.

5. The diesel generators and auxiliaries satisfactorily operate to maintain 110 percent load for a two hour period followed by 100 percent load for a 22 hour period.

6. Each diesel generator unit will accept assigned shutdown loads in the required sequence and maintain speed, voltage and frequency within design limits as described in FSAR section 8.3.1.

7. The ADGU can be aligned and operated in place of either EDGU as described in FSAR section 8.3.1.

8. Each diesel generator will maintain voltage and speed upon rejection of largest single load and full load as described in FSAR section 8.3.1.

9. All alarms, automatic and manual (local and remote) controls, interlocks, and protective features of the diesel generators and auxiliaries operate in accordance with FSAR sections 8.3.1 and 9.5.6, and applicable design documents.

AC POWER DISTRIBUTION SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the two offsite power sources (normal and alternate) to independently provide power to the 6.9 Kv and 480 Volt AC Distribution System. The load carrying capability of system components (transformers, switchgear, breakers, etc.) will be demonstrated by proper normal operation of loads. Other design features including redundance, independence, interlocks, load shedding, and manual and automatic transfers will be demonstrated.

To collect grid, 6900, and 480 volt Class 1E bus operating data under no-load, steady state, and transient conditions for comparison to engineering voltage calculations.

PREREQUISITES

1. The common and unit station service transformers are energized or available for energization as required.

2. The shutdown boards are energized or available for energization as required.

3. Metering and relaying circuits have been calibrated and are operational.

4. DC control power is available as required.

5. The diesel generator sets and supporting auxiliaries are operational as required.

6. Transformer tap settings are in accordance with design requirements.

TEST METHOD

1. Verify that failure/faults in one of the offsite power sources will isolate the affected source but does not lead to the failure/isolation of both sources

2. Confirm that loss of either redundant safety related train will not impair the ability of the remaining system to supply power to the required safety related loads.

3. Verify operation of alarms, tripping devices, and interlocks are in accordance with design drawings.

AC POWER DISTRIBUTION SYSTEM
TEST SUMMARY

TEST METHOD (continued)

4. Demonstrate proper operation of remote and local control and indicating devices for shutdown boards and safety related motor control centers.

5 Demonstrate manual and automatic transfer schemes operate in accordance with design drawings.

6. Verify each of the offsite power sources provide the required no-load voltage to assigned 6.9Kv boards and in turn to the 480 V boards.

7. Verify proper load shedding and/or undervoltage protection of all 6.9 Kv shutdown boards and 480 Volt shutdown boards and confirm diesel generator units receive proper start signals.

8. Verify the capability of each common station transformer to carry the load required to supply ESF loads of one unit under loss of coolant accident conditions in addition to power required for shutdown of the non-accident unit.

9. Select the Class 1E train having the lowest analyzed voltage and record grid, 6900 and 480 volt bus parameters at no-load, steady state (minimum 30% of worst case load), and transient conditions. Induce the transient by the non-concurrent start of a Class 1E 6.9kv motor and a non-class 1E 6.9kv motor.

NOTE: Vital 120 volt AC power voltage surveys will be performed in conjunction with this test.

ACCEPTANCE CRITERIA

1. The offsite power system provides two independent sources of power at the required design no-load voltage level to the onsite power system as described in FSAR section 8.2.1.

2. The AC Distribution System provides power at the design voltage level to safety related loads when supplied power from the normal, alternate, or onsite (standby) power supplies as described in FSAR section 8.3.1.

3. Power supply to safety related loads will automatically and manually transfer to the onsite (standby) diesel units from the normal or alternate supply or manually from the diesel generator units back to the normal or alternate supply as described by FSAR section 8.3.1.

AC POWER DISTRIBUTION SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA (continued)

4. Safety related trains will operate independent of each other.

5. Interlocks, alarms, controls, tripping, and lockout devices function in accordance with design drawings.

6. AC Distribution System components operate in accordance with vendor and design documents and will carry loads approximating normal operating conditions.

7. No-load, steady state, and transient voltages are within 3% of the analyzed values.

DC POWER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Vital 125 Volt DC Power Systems to supply power to assigned loads during normal and loss of AC power conditions.

PREREQUISITES

1. Batteries are in a nominally full charged condition.
2. AC power is available to battery chargers.
3. The applicable battery area ventilation system is operational.
4. Protective devices including ground detection, breakers, system status sensing devices, relays, and meters have been calibrated.
5. DC power distribution equipment including breakers, cables, and panels are energized or are available for energization.

TEST METHOD

1. Measure the battery charger DC output voltage with and without the batteries connected.
2. Fully recharge the vital 125 Vdc batteries from a minimum design charge condition while supplying steady state loads.
3. Vary and record the charger output voltage over the span specified by the vendor for normal and equalizing operation.
4. Perform a discharge test of the vital 125 Vdc batteries in accordance with IEEE 450-1980 as described in FSAR section 8.3.2.1.1.
5. Verify the batteries and chargers will supply DC power to assigned distribution panels.
6. Disconnect the vital 125 Vdc batteries and chargers from each channel loads to verify electrical independence.
7. Connect the fifth vital 125 Vdc battery to each of the vital 125 Vdc channels (I, II, III, IV).

TEST METHOD (continued)

8. Actuate alarms and protective devices with actual or simulated input signals. Observe local and remote voltage, current and status indicators during battery and charger testing. Operate breakers to transfer and/or energize loads.

9. Measure current for selected loads for comparison to design basis load analysis.

ACCEPTANCE CRITERIA

1. Battery charger output voltage is regulated within tolerance of its nominal design output voltage under loaded and no-load conditions.

2. The vital 125 Vdc battery chargers are able to restore the batteries to a fully charged condition from a minimum design discharge condition within the design time limit while also supplying normal steady state loads.

3. Battery charger output voltages are adjustable over the span specified by the vendor for normal and equalizing operation.

4. The vital 125 Vdc batteries will provide power to essential loads for the required time period with the battery chargers out of service without exceeding minimum DC System or individual cell voltage limits as described in FSAR section 8.3.2.1.1.

5. Nominal design DC voltage is supplied to all DC distribution panels.

6. The loss of either redundant vital 125 Vdc channel will not impair the ability of remaining channels to supply power to assigned loads.

7. The fifth vital 125 Vdc battery can be transferred to supply power to each of the vital 125 Vdc channels as described in FSAR section 8.3.2.1.1.

8. Alarms, protective devices, indicators, breakers, and interlocks operate in accordance with vendor and design documents.

VITAL 120V AC POWER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Vital 120V AC Control Power System to provide uninteruptible power to instrumentation and control loads.

To collect Vital 120 volt bus operating data under no-load, steady state, and transient conditions for comparison to engineering voltage calculations.

PREREQUISITES

1. 480 VAC and 125 VDC power supplies are available to the inverter units.

2. The common backup source of 120 VAC power is available to the instrument distribution panels.

3. Inverter test load is available.

TEST METHOD

1. Verify that the system inverters maintain the current and voltage to the instrument distribution panels within the required limits while under maximum load.

2. Demonstrate the ability of the inverters to automatically switch between the 480V AC and the 125V DC power sources, while delivering the maximum demand load, and maintaining voltage and frequency within specified design limits.

3. Simulate alarm and protective action conditions.

4. Verify operation of the inverter synchronizing and internal clock.

5. Measure current from selected loads. This data will be used in analysis to determine the design basis load.

6. Verify that AC and DC power supplies to the inverters are connected to the proper safety train.

7. Demonstrate the loss of either division (channel) will not cause a loss of the remaining channels.

8. Transfer distribution board power supply from the inverter source to the 120V AC maintenance source and back to the inverter source.

VITAL 120V AC POWER SYSTEM
TEST SUMMARY

TEST METHOD (continued)

9. Record 120 volt buss operating parameters required by Engineering for comparison to voltage calculations. This data will be collected concurrently with the 6.9kv and 480 volt Class 1E survey.

ACCEPTANCE CRITERIA

1. The inverters provide rated output voltage and current under maximum load conditions when supplied from the normal 480V AC input or 125V DC alternate input power sources as described in FSAR section 8.3.1.

2. The inverters are capable of providing continuous rated output within design limits during transfer from the normal AC to the DC alternate input power source as described in FSAR section 8.3.1.

3. Alarms and protective features function properly in accordance with design and vendor documents.

4. Distribution boards can be energized from the associated inverter or from the 120V AC maintenance source without interrupting service.

5. Each of the four channels are independent from the others as described in FSAR section 8.3.1.

6. No-load, steady state, and transient voltages are within 3% of the analyzed values.

EMERGENCY LIGHTING SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Standby and Emergency Lighting Systems to provide lighting in those locations where safety-related functions are performed.

PREREQUISITES

1. AC and DC electrical power supplies are available as required.
2. The battery-pack operated lighting units are in service.

TEST METHOD

1. Verify AC power supplies to standby lighting system are connected to proper safety train.
2. De-energize power supplies to the normal lighting and verify standby lighting system provides adequate illumination.
3. De-energize power supplies to normal lighting and power supplies to standby lighting systems and verify emergency 125 Volt DC and battery pack lighting energizes and provides adequate illumination.

ACCEPTANCE CRITERIA

1. The Standby and Emergency Lighting Systems operate in accordance with design requirements, supplying the required level of illumination to the required areas for the required duration as described in FSAR section 9.5.3.
2. The 125 Volt DC and battery pack lighting initiates when power to the AC standby lighting system is lost as described in FSAR section 9.5.3.

COMMUNICATIONS SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Sound-Powered Telephone System and the Codes, Alarms and Paging (CAP) System to provide adequate communication coverage and audibility.

PREREQUISITES

1. Installation and construction testing of the Plant Communication and Evacuation Alarm Systems.

2. Plant equipment and systems are operating so as to create an ambient noise level that would be expected during normal plant operation.

TEST METHOD

1. Demonstrate proper functioning of the Sound-Powered Telephone System to provide intelligible reception and transmission of voice communications between assigned locations.

2. Verify proper functioning and audibility of the CAP System to provide paging and sound evacuation, fire, and medical alarms.

ACCEPTANCE CRITERIA

1. The codes, alarms, and paging system provides for audible paging and alarm signaling as described in FSAR section 9.5.2.

2. The sound powered telephone system provides for audible communication between locations described in FSAR section 9.5.2.

3. Evacuation, fire, and medical alarms, all clear signals and personnel pages are audible with normally expected background noise level.

REACTOR PROTECTION SYSTEM
TEST SUMMARY

OBJECTIVE

The purpose of this test is to verify the capability of the Reactor Protection System (RPS) to perform protective functions and to verify satisfactory RPS response times.

PREREQUISITE

1. Electrical power must be available to operate the reactor plant and electrical systems, instruments and reactor protection system equipment and recorders.

2. Lead/Lag coefficients will be set according to Precautions, Limitations and Setpoints requirements and the circuitry is operable. There will be no attempt to defeat or desensitize the effect of lead/lag compensation for this test.

3. Associated instrumentation systems will be complete, aligned and calibrated in accordance with the Precautions, Limitations, and Setpoints Document.

TEST METHOD

1. Demonstrate proper operation of the RPS and Engineered Safety Features Actuation System.

2. Determine the process fluid variable to sensor input delay time analytically.

3. Determine RPS sensor response time using simulated input signals.

4. Verify the Eagle 21 delay time is within design requirements.

5. Verify the response of the logic channels for all logic combinations.

6. Determine reactor trip and bypass breaker delay time.

7. Compile the total reactor trip and ESFAS time response.

ACCEPTANCE CRITERIA

1. The Reactor Protection System and Engineered Safety Features Actuation System functions in response to logic initiation signals in accordance with the design requirements as described in FSAR sections 7.2 and 7.3 and design drawings.

2. Response time of the RPS logic channels including RPS sensors is in accordance with design requirements and the Technical Specifications and Requirements Document.

REACTOR PRESSURE BOUNDARY (RCPB) LEAKAGE DETECTION SYSTEM TEST SUMMARY

OBJECTIVE

Demonstrate that the instrumentation used to detect reactor coolant leakage is functional.

PREREQUISITES

1. Instruments are installed and available for testing.

TEST METHOD

1. Verify calibration and sensitivity of the humidity monitor and its proper annunciation and recording.

2. Verify proper calibration and annunciation of the reactor vessel flange leakoff, containment pressure, and temperature monitors.

3. Verify proper operation and annunciation of an abnormal rate of rise in the Reactor Building floor and equipment drain sump.

4. Verify proper operation of containment temperature detectors and instrumentation.

5. Provide actual or simulated input signals to verify operation of alarms, controls, interlocks, and instrumentation.

ACCEPTANCE CRITERIA

1. Instrumentation and alarms operate properly and in accordance with design requirements as described in FSAR section 5.2.7.

Note: Containment air particulate and radioactive gas monitors are addressed in the test summaries for the Area and Process Radiation Monitoring System.

EXCORE NUCLEAR INSTRUMENTATION
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the Nuclear Instrumentation System including its ability to provide required indications, alarms, control and protective functions.

PREREQUISITES

1. The Nuclear Instrumentation System is installed and the calibration and alignment has been completed according to the manufacturer's instructions.

2. System has been operational for at least 1 hour.

3. The Solid State Protection System, Auxiliary Relay Panels, and the Annunciator System are operational as required to support this test.

TEST METHOD

1. Demonstrate the capability of source, intermediate and power range circuitry to respond to simulated test signals.

2. Verify that the source range detectors properly respond to a neutron source.

3. Demonstrate proper operation of the auctioneered circuits and flux channel deviation signals.

4. Check all channels to verify high level trip functions, alarm setpoints, and audible count rates where applicable.

ACCEPTANCE CRITERIA

1. The control and indication functions and associated setpoints of the Nuclear Instrumentation System function in accordance with design requirements as described in FSAR section 7.2 and the Precautions, Limitations and Setpoint Document.

2. The Nuclear Instrumentation System output signals to the reactor protection system function in accordance with FSAR section 7.2.

3. The source range detectors respond properly to a neutron source.

4. The source range detectors are not affected by electrical noise.

SEISMIC INSTRUMENTATION
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of installed seismic instrumentation and its capability to monitor and record.

PREREQUISITES

1. A calibrated seismic test signal is available as required by the vendor manuals..

TEST METHOD

1. Verify a seismic test signal will activate the instrumentation as required at an acceptable level.

2. Demonstrate proper operation of seismic instrumentation components and alarms, including the triggering device, recording and playback system, and peak acceleration recorders.

ACCEPTANCE CRITERIA

1. The seismic instrumentation is capable of being aligned in accordance with the vendor technical manual.

2. The system instruments, including trip settings, demonstrate correct response and outputs in response to simulated input signals as described in FSAR section 7.4.

STEAM GENERATOR SAFETY & ATMOSPHERIC RELIEF VALVES TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the main steam atmospheric relief valves and to verify the setpoints of main steam safety valves associated with each steam generator.

PREREQUISITES

1. Plant conditions are established as necessary for test performance.

2. A pressure-assist device is available for use in lifting the safety valves and equipment is available to measure lift and reset pressures.

3. Test equipment is available to measure the atmospheric relief valve stroke time.

TEST METHOD

1. Verify proper actuation and operation of the atmospheric relief valves at normal system operating pressure.

2. Lift each safety valve with a pressure-assist device and measure the lifting pressure to ensure setpoints are as required.

3. Determine the full stroke time of each atmospheric relief valve at normal system operating pressure.

4. With the steam generators at normal operating pressure, verify leakage through the atmospheric relief valves and safety valves is within acceptable limits.

ACCEPTANCE CRITERIA

1. Operation of the steam generator atmospheric relief valves and setpoints of the safety valves are in accordance with design requirements as described in the FSAR section 10.3.2.

2. The relief and safety valves reseat properly and do not chatter.

3. Leakage through relief and safety valves at normal operating pressure is within limits of the technical specifications.

MAIN STEAM AND FEEDWATER ISOLATION VALVES
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the Main Steam and Feedwater isolation and bypass isolation valves including their ability to close automatically as required.

PREREQUISITES

1. Plant conditions are established as required for test performance.
2. Electrical power and control air is available.
3. The solid state protection system is operable.
4. Test equipment is available to measure the valve closure time.

TEST METHOD

1. Demonstrate remote and control room operation of the isolation valves.
2. Verify the capability of the isolation valves to close upon receipt of an isolation signal.
3. Measure the closure time of isolation and bypass valves.
4. Verify the isolation valves will close upon receipt of a simulated signal from either power train.

ACCEPTANCE CRITERIA

1. The main steam and feedwater isolation valves and bypass valves close upon receipt of an isolation signal in accordance with FSAR section 6.2.4, 10.3 and 10.4.7 as applicable.
2. Isolation valve closure time is in accordance with the Technical Specification requirements.
3. Controls, interlocks, alarms and operation of the main steam, feedwater isolation valves and bypass valves is in accordance with FSAR section 10.3 and 10.4.7 and the associated design drawings.

AUXILIARY FEEDWATER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability and reliability of the Auxiliary Feedwater System to supply feedwater to the steam generators and to maintain steam generator water inventory as required.

PREREQUISITES

1. Verify system is configured as necessary for unit/plant operation.

2. Steam supply is available for the turbine-driven Auxiliary Feedwater pump.

3. An acceptable water supply is available for the Condensate Storage Tank.

4. Interfacing systems needed to support testing of the Auxiliary Feedwater System are available.

TEST METHOD

1. Demonstrate proper manual and automatic operation of suction and discharge valves on the motor and turbine driven pumps and the steam supply to the turbine-driven pump.

2. Verify proper functioning of local and remote means of component control.

3. Verify that the hydraulic performance of each pump meets design requirements.

4. Demonstrate that the motor driven and turbine-driven pumps are capable of delivering rated flow to the steam generators within the acceptable time after an initiating signal.

5. Check for proper operation of the steam driven AF pump instrumentation, control interlocks and alarms including governor valve and turbine speed control.

6. Verify the capability of the flow limiter to prevent pump runout.

7. Verify the operability of the Essential Raw Cooling Water System interface with the Auxiliary Feedwater Suction Header (essential raw cooling water will not be introduced into the Auxiliary Feedwater System).

AUXILIARY FEEDWATER SYSTEM
TEST SUMMARY

TEST METHOD (continued)

8. Feedwater bypass line check valves operate properly.

9. Start the steam driven auxiliary feedwater pump five consecutive times from a cold condition.

ACCEPTANCE CRITERIA

1. The hydraulic performance of the auxiliary feedwater pumps meets or exceeds design requirements as described in FSAR section 10.4.9.

2. Automatic and manual (local and remote) controls, interlocks, and alarms operate in accordance with design drawings.

3. Flow restrictors prevent pump flow from exceeding run-out condition.

4. The auxiliary feedwater pumps deliver rated flow within the time required by design as described in FSAR section 10.4.9.

5. The steam driven auxiliary feedwater pump successfully starts and achieves rated speed within the time required five consecutive times from a cold condition.

FUEL HANDLING AND VESSEL SERVICING EQUIPMENT
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the fuel handling and vessel servicing equipment, including the handling tools and equipment, cranes and fuel transfer system.

To provide for final indexing of the manipulator crane and to establish reference marks for the manipulator crane bridge using a verified dimensionally correct dummy assembly.

To provide the opportunity for training fuel handlers prior to actual fuel loading.

PREREQUISITES

1. The refueling cavity, refueling canal and spent fuel pool are clean and areas adjacent to the system equipment are clear.

2. Dummy assembly, test weights and test fixtures are available as required for testing the manipulator crane and spent fuel bridge crane.

3. Load testing of the reactor head and internals lifting fixtures has been completed.

TEST METHOD

1. With the use of a dummy assembly demonstrate the proper operation of all system components, including the manipulator crane, spent fuel pit bridge and electric hoist, new fuel elevator, fuel transfer system, rod control cluster control changing fixtures, various handling tools, and indexing of the system.

2. Verify operation of interlocks and proper setting of limit switches.

3. Demonstrate proper operation of crane and hoist controls including overspeed, overloads and travel limits, and warning devices.

4. Demonstrate hoist, bridge and trolley travel is acceptable.

5. Verify the operation of the hoist braking systems.

6. Perform a 125% static load test and a 100% full load operational test on the Manipulator Crane and the Spent Fuel Pit Bridge Crane, Reactor Building Polar Crane and the Auxiliary Building Overhead Crane.

FUEL HANDLING AND VESSEL SERVICING EQUIPMENT TEST SUMMARY

ACCEPTANCE CRITERIA

Fuel transfer system operation,controls and interlocks function in accordance with FSAR section 9.1.4 and the vendor technical manual and drawings.

All Manipulator Crane operation controls and interlocks function in accordance with FSAR section 9.1.4 and the vendor technical manual and drawings.

The RCC change fixture's function to remove, store, and load RCC's has been successfully demonstrated in accordance with FSAR section 9.1.4.

Final Manipulator Crane indexing is completed and the Manipulator Crane has proven repeatability at various core locations.

Spent Fuel Pit Bridge, Reactor Building Polar and Auxiliary Building overhead crane controls and interlocks function in accordance with the appropriate design drawings and technical manuals.

Manipulator Crane, the Spent Fuel Pit Bridge Crane, Reactor Building Polar Crane and the Auxiliary Building Overhead Crane have been successfully load tested.

REACTOR COOLANT SYSTEM COLD HYDROSTATIC TEST
TEST SUMMARY

OBJECTIVE

To verify the integrity and leak-tightness of the Reactor Coolant System (RCS) and high pressure portion of systems connected to the RCS, by performing a hydrostatic test of the system in accordance with Section III of the ASME Boiler and Pressure Vessel Code.

PREREQUISITES

1. The reciprocating charging pump is operational.

2. A water supply within acceptable chemistry and temperature limits is available for pressurizing the reactor coolant system.

3. The reactor coolant pumps are operational.

4. The reactor lower internals, upper internals, and vessel head are installed and the head studs are tensioned for hydrostatic test pressure.

5. Temporary temperature and pressure test instrumentation is calibrated and installed or available.

TEST METHOD

1. The reactor coolant pumps will be operated as required to properly vent the RCS and establish the required temperature prior to pressurizing the RCS to test pressure.

2. Pressurize the RCS within the maximum rate and in the prescribed increments until the desired test pressure is obtained, and stabilize at the test pressure for the required time.

3. Perform inspections of welds, joints, piping, and components within the test boundary.

4. Reduce system pressure to below test pressure.

ACCEPTANCE CRITERIA

1. No leakage from welds within the test boundary is observed.

2. Test pressure is maintained for the time required by Section III of the ASME Boiler and Pressure Vessel Code.

INTEGRATED HOT FUNCTIONAL TESTS
TEST SUMMARY

OBJECTIVE

To establish initial plant conditions required for performance of preoperational and acceptance tests of primary, secondary, and auxiliary systems which require normal operating temperature and pressure of the reactor coolant system. The HFT procedure will control plant conditions as required to properly sequence of these tests during heatup, while at normal operating temperature and pressure, and during cooldown.

To perform operational checks of the reactor coolant system components including pumps, motors, valves, instruments used during plant heatup from cold shutdown conditions to normal operating temperature and pressure prior to core loading. This heatup/cooldown also affords the opportunity to demonstrate the adequacy of plant operating procedures.

To collect any foreign material, having a cross section greater than 1/16 inch, which may be present in the reactor coolant system.

To operate the reactor coolant system at full flow conditions for a minimum of 240 cumulative hours to achieve one million vibration cycles of the reactor internals.

PREREQUISITES

1. The RCS Cold Hydrostatic Test has been completed.

2. All systems, or portions of systems, and components whose adequacy or proper operations are to be verified under hot plant conditions, are operational.

3. The reactor vessel internals vibration baseline inspection has been completed and the internals are installed.

4. Full flow filters have been installed in the reactor vessel.

5. The reactor coolant system has been filled and vented.

6. Prior to demonstrating remote shutdown capability, establish the prerequisites required by Regulatory Position C.2 and minimum crew size required by Regulatory Position C.3 of Regulatory Guide 1.68.2, Revision 1.

INTEGRATED HOT FUNCTIONAL TESTS
TEST SUMMARY

TEST METHOD

1. Heat the RCS to normal operating temperature and pressure using heat from the reactor coolant pumps and pressurizer heaters. Verify proper operation of the reactor coolant pumps, motors, and seals.

2. Verify the thermal expansion of system components and piping.

3. Perform isothermal calibration of Resistance Temperature Detector and incore thermocouples.

4. Verify capability of the Chemical and Volume Control System to provide charging water at rated flow against normal reactor coolant pressure, check letdown design flow rate for each applicable operating mode, and check response of the system to changes in pressurizer level.

5. Verify proper operation of steam generator instrumentation to changes in steam generator level.

6. Demonstrate proper functioning of the main steam isolation valves under normal operating pressures and temperature conditions.

7. Operate the RC pumps for a minimum of 240 hours at full flow in order to achieve greater than one million cycles on the vessel internals. Following hot functional testing, the internals are to be removed and inspected for vibration effects.

8. Perform periodic vibrations measurements on RCS components as required.

9. Verify acceptability of the excess letdown and seal water flows.

10 Demonstrate proper operation of the pressurizer pressure control system.

11 Demonstrate proper operation of the steam dump control system.

12 Demonstrate proper operation of the RV head vent system.

13 Demonstrate proper operation of the motor and steam driven auxiliary feedwater pumps.

TEST METHOD (continued)

14 Demonstrate the ability to cooldown the plant in a controlled manner from the Main Control Room and from outside the Main Control Room (Auxiliary Control Room). During cooldown from outside the control room, the RCS pressure and temperature will be reduced to allow operation of the RHR system and subsequent cooldown of at least 50 degrees using RHR in accordance with Regulatory Position C.4 of Regulatory Guide 1.68.2, Revision 1.

ACCEPTANCE CRITERIA

1. The Reactor Coolant System has been operated at full flow conditions for a minimum of 240 cumulative hours.

2. Tests requiring the RCS to be at normal operating pressure and temperature have been completed.

3. Automatic controls, alarms, and interlocks operate in accordance with design drawings.

4. Rector coolant pumps operate in accordance in accordance with vendor documents.

OPERATIONAL VIBRATION TESTING
TEST SUMMARY

OBJECTIVE

To verify acceptable vibration levels exist for all (1) Class 1, 2, and 3 piping (2) other high-energy piping systems inside Seismic Category I Structures, (3) high-energy portions of systems, whose failure could reduce the functioning of any Seismic Category I Plant Feature to an unacceptable level.

PREREQUISITES

1. Systems are operational as required.
2. Instrumentation is in place for testing as required.

TEST METHOD

1. Subject the specified piping systems to various flow modes and transients such as pump trips and valve closures as required.
2. Visually inspect and/or measure the vibration level of the piping and components at the specified locations.
3. Following completion of the system transient test, visually inspect the piping and supports including snubbers for damage, looseness of parts, etc.

ACCEPTANCE CRITERIA

The vibration level for piping and components are within acceptable limits in accordance with the requirements of FSAR Sections 3.9.2.1.

CONTAINMENT INTEGRATED LEAK RATE TEST
TEST SUMMARY

OBJECTIVE

To verify the primary reactor containment overall integrated leakage rate is within acceptable limits.

PREREQUISITES

1. Fluid system conditions are established as applicable to simulate post accident conditions which extend the boundary of the Containment Building.

2. Containment pressure retaining boundary, leakage limiting boundary, and isolation valve leak tests have been satisfactorily performed.

3. All containment isolation valves have been closed by normal actuation methods.

4. The vendor containment over pressurization (structural integrity) test has been successfully completed.

TEST METHOD

1. Perform the containment integrated leak rate test per Appendix J to 10 CFR Part 50.

2. Perform the leakage rate calculation by using the mass-point methodology as described by ANSI/ANI 56.8-1987, ANSI N45.4-1972, and BN-TOP-1.

3. If during the performance of a type A test, excessive leakage occurs through locally testable penetrations or isolation valves, these leakage paths may be isolated and the Type A test continued until completion. The sum of the post repaired minimum pathway local leakage rate values will be added to the UCL per ANSI 56.8-1981.

ACCEPTANCE CRITERIA

The Containment Integrated Leak Rate Test meets the requirements of Appendix J to 10 CFR Part 50.

Note:

The containment structural integrity test described in FSAR Section 3.8 may be performed concurrently with the Integrated Leak Rate Test.

CONTAINMENT ISOLATION
TEST SUMMARY

OBJECTIVE

Demonstrate the capability of various plant system components to properly respond to Phase A and Phase B containment isolation signals and to containment ventilation isolation signals.

PREREQUISITES

1. All systems with applicable automatic containment isolation valves are in a status allowing operation of these valves.

TEST METHOD

1. Verify manual operation of all containment isolation valves.

2. Verify all valves designed to isolate containment in response to Phase A and Phase B containment isolation and containment ventilation isolation signals properly actuate in response to these signals.

3. Demonstrate the operation and independence of redundant trains of containment isolation components.

4. Verify air operated valves fail to the accident position upon loss of air or electrical power.

5. Measure the time required for isolation valves to close.

6. After isolation valve closure, reset the isolation signal and verify the isolation valve remains in the accident position.

ACCEPTANCE CRITERIA

1. All containment isolation valves designed to isolate on receipt of a Phase A or Phase B containment isolation signal or containment ventilation isolation signal properly respond to receipt of the appropriate signal as described in FSAR section 6.2.4.

2. The closure time of containment isolation valves is equal to or less than the time requirements specified in FSAR Table 6.2.4-1.

3. Containment isolation valves remain in the accident position after reset of the isolation signal.

COMPRESSED AIR SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Compressed Air System to provide regulated air that is clean, dry and oil-free to instrumentation and control loads during normal plant operation and to vital equipment required for safe shutdown under design basis event conditions.

PREREQUISITES

1. AC and DC electrical power supplies are available.
2. The system has been blown-down and verified to be clean in accordance with approved cleanliness standards.
3. Cooling water is available.
4. The system filters are installed and dryers loaded with desiccant.

TEST METHOD

1. Simulate signals required to verify proper operation of automatic controls, interlocks, and alarms including:
    a. Automatic isolation of the Auxiliary Air System from the Station Air System on loss of air pressure in the Station Air System.
    b. Automatic start of the Auxiliary Air Compressors on receipt of a low auxiliary control air header pressure signal.
2. Verify automatic operation of air dryers for one regeneration cycle.
3. Measure the dewpoint of Station Control Air and Auxiliary Control Air.
4. Operate the station air compressors and auxiliary air compressors to verify proper operation of unit controls and cooling water. Verify proper compressor capacity and pressure.
5. Perform a slow loss of Auxiliary Control Air System pressure by isolating as many branch lines as practical with the affected loads in their normal operating position to verify response of supplied loads.

COMPRESSED AIR SYSTEM
TEST SUMMARY

TEST METHOD (continued)

6. With the Auxiliary Control Air System operating in a steady state condition, operate at least two of the highest demand loads supplied from the same train, simultaneously.

ACCEPTANCE CRITERIA

1. The station air compressors, auxiliary air compressors and associated air dryers properly operate to provide compressed air that meets or exceeds design requirements for air-flow and dewpoint and is within design pressure limits as described in FSAR section 9.3.1.

2. Automatic controls including system isolation features, interlocks, and alarms operate in accordance with design drawings.

3 Auxiliary Control Air loads respond properly to a slow loss of system air pressure as described by design documents.

4. Simultaneous operation of the two highest demand loads supplied from each train will not cause unacceptable system pressure transients as described in applicable design documents.

ICE CONDENSER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the operability of the Ice Condenser, Doors, associated air handling components, glycol circulation, refrigeration, floor cooling, and drain subsystems.

PREREQUISITES

1. All system components have been installed.
2. The Raw Cooling Water System and Demineralized Water System are available.
3. System relief valve setpoints have been verified.
4. Heat tracing is installed on Air Handling Unit drains and is available for use.
5. Air handling units, glycol circulation and refrigeration equipment is operable.

TEST METHOD

1. Demonstrate the proper operation of the refrigeration chiller packages, glycol circulation equipment, air handling units and the floor cooling and drain system.
2. Demonstrate the ice condenser can be adequately cooled to and maintained at design conditions.
3. Verify the ice condenser has been loaded with the proper quantity and quality of the ice.
4. Verify all system controls, interlocks, instrumentation, heat tracing, and alarms function properly to simulated or actual signals.

ACCEPTANCE CRITERIA

1. The Ice Condenser System components, controls, interlocks, instrumentation and alarms function in accordance with FSAR section 6.7 and the appropriate design basis documents.
2. The Ice Condenser has been loaded with the proper quantity and quality of borated ice as required in FSAR section 6.7.

PRESSURIZER SAFETY AND RELIEF VALVES
TEST SUMMARY

OBJECTIVE

To demonstrate the proper operation of the pressurizer power-operated relief valves, pressurizer relief tank, and leaktightness of the pressurizer relief and safety valves.

PREREQUISITES

1. Plant conditions are established as necessary for test performance.

2. The pressurizer relief tank is filled to its normal level.

3. Primary makeup water supply is available as required.

4. The pressurizer safety valves have been bench tested to verify their setpoints and installed.

TEST METHOD

1. Verify proper actuation and operation of the power-operated relief valves.

2. Check operation of the discharge header leak detection devices.

3. Verify proper operation of the pressurizer relief tank level control system, instrumentation, interlocks, and alarms.

4. Confirm that cooling spray to the pressurizer relief tank meets design requirements.

ACCEPTANCE CRITERIA

1. The pressurizer power-operated relief valves and isolation valves operate in accordance with design as described in FSAR sections 5.2.2.

2. The pressurizer relief tank level control and alarms operate in accordance with design as described in FSAR section 5.5.11 and applicable design documents.

3. Power operated relief valve and safety valve leakage is within technical specification limits.

4. Controls, instrumentation, interlocks and alarms operate properly in response to simulated or normal input signals as described in FSAR section 5.2.2 and applicable design documents.

INTAKE PUMP STATION VENTILATION SYSTEM
TEST SUMMARY

OBJECTIVE

Demonstrate proper operation of the Intake Pump Station (IPS) ventilation equipment.

PREREQUISITES

1. System sufficiently complete to support testing.
2. AC and DC electrical power supplies are available.
3. Control air is available for valve and damper operation.

TEST METHOD

1. Demonstrate proper operation of the ventilation supply and exhaust fans, shutoff louvers and dampers. Verify adequate flow to areas serviced by each portion of the system.
2. Verify all alarms and interlocks function properly.
3. Verify proper operation of the IPS unit and duct heaters.

ACCEPTANCE CRITERIA

1. The Essential Raw Cooling Water Intake Pumping Station Ventilation System maintains area temperatures and air flows as described in FSAR section 9.4.5.1.
2. Manual and automatic controls, interlocks, auto start features, alarms, function in accordance with design documents.

STEAM GENERATOR BLOWDOWN SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability and performance of the Steam Generator Blowdown (SGBD) system and components to adequately control steam generator water chemistry.

PREREQUISITES

1. AC and DC electrical power is available.
2. Control air is available for component operation.
3. The condenser and cooling towers are available.
4. Plant conditions are established as necessary for test performance.

TEST METHOD

1. Demonstrate the SGBD isolation valves close upon required isolation signals.
2. Demonstrate SGBD flowpaths in normal and flood mode conditions.
3. Verify the SGBD system can maintain proper steam generator water chemistry during hot functional testing. Verify design blowdown rates can be achieved.
4. Demonstrate proper operation of the SGBD flash tank and pumps.
5. Verify SGBD controls divert blowdown from the cooling tower upon a high radiation signal.
6. Verify controls, interlocks and alarms function properly in response to actual or simulated signals.

ACCEPTANCE CRITERIA

1. SGBD components, control, interlocks and alarms function in accordance with FSAR section 10.4.8 and associated design documents.
2. The SGBD system can achieve design blowdown rates and maintain steam generator chemistry as required by FSAR section 10.4.8.

MAIN STEAM SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the operability and performance of Main Steam components during hot functional testing.

PREREQUISITES

1. Steam dump control system is operational.

2. Main condenser and circulating water system are in operation.

3. Plant conditions during hot functional testing are established as necessary for test conduct.

4. All support systems required to perform the test are in service.

TEST METHOD

1. Demonstrate proper operation of the turbine bypass system (condenser steam dump valves) to actual or simulated signals.

2. Verify Main Steam components, controls, interlocks and alarms function properly in response to simulated or actual signals.

ACCEPTANCE CRITERIA

1. Main Steam components, controls, interlocks and alarms function in accordance with the requirements of FSAR section 10.3 and associated design drawings.

2. The Turbine Bypass system (condenser steam dump valves) operate in accordance with the requirements of FSAR section 10.4.4 and associated design drawings.

FEEDWATER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Main Feedwater System to provide a regulated supply of water to the steam generators in response to steam generator level control demand.

PREREQUISITES

1. System sufficiently complete to support testing.
2. AC and DC electrical power supplies are available.
3. Control air is available for component operation.
4. The Condensate System is available and a adequate supply of clean water is available in the condenser hotwell and condensate storage tank.
5. The system is aligned for normal operation.
6. The steam generator feedwater pumps and associated lube oil and seal water auxiliaries are operational.
7. The automatic steam generator level controls for feedwater regulating and bypass valves have been calibrated and are operational.

TEST METHOD

1. Verify proper operation of the feedwater system controls, interlocks and alarms by normal operation or simulation of required input signals.
2. Operate the main (turbine driven) and standby (motor driven) feedwater pumps and verify performance on recirculation path during Integrated Hot Functional Tests.

ACCEPTANCE CRITERIA

1 The hydraulic performance of the main and standby feedwater pumps meets or exceeds design requirements as described in FSAR section 10.4.7.

2. Automatic and manual controls, interlocks, and alarms operate properly in accordance with design drawings.

CONDENSATE AND CONDENSER VACUUM SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the Condensate and Condenser Vacuum Systems are capable of providing an adequate supply of high quality deaerated water to the Feedwater System and maintain condenser water levels within operational limits.

PREREQUISITES

1. System sufficiently complete to support testing.

2. AC and DC electrical power supplies are available.

3. Control air is available for component operation.

4. A adequate supply of clean water is available in the condenser hotwell and condensate storage tank.

5. The vacuum pumps are operable and support systems including seal and cooling water are available.

6. The Condensate and Condenser Vacuum system is aligned for normal operation.

TEST METHOD

1. Verify proper operation and hydraulic performance of the condenser hotwell pumps, condensate booster pumps, and the demineralizer condensate pumps.

2. Demonstrate proper differential pressure control and flow through the condensate polishing demineralizers and verify water quality of condensate polisher effluent.

3. Demonstrate the operation of the condensate transfer pumps including head and flow characteristics.

4. Demonstrate level controls will maintain proper hotwell level.

5. Demonstrate the capability of the condenser vacuum system to draw and maintain a vacuum on the condenser and verify proper operation of the vacuum pumps.

6. Verify proper operation of the condensate and condenser vacuum system controls, interlocks and alarms by normal operation or simulation of required input signals.

CONDENSATE AND CONDENSER VACUUM SYSTEM
TEST SUMMARY

ACCEPTANCE CRITERIA

1 The hydraulic performance of the hotwell pumps, condensate booster pumps, demineralizer condensate pumps, and condensate transfer pumps meets or exceeds design requirements as described in FSAR section 10.4.7.

2 The condensate polishing demineralizers produce condensate quality water at design flow and pressure conditions as described in FSAR section 10.4.6.

3. The condensate vacuum pumps can draw and maintain condenser vacuum in accordance with design requirements described in FSAR section 10.4.2

4. Automatic and manual controls, interlocks including condenser vacuum offgas isolation, and alarms operate properly in accordance with design drawings.

CONDENSER CIRCULATING WATER SYSTEM
TEST SUMMARY

OBJECTIVE

To demonstrate the capability of the Condenser Circulating Water (CCW) system to provide adequate cooling to the main turbine condensers for removing and dissipating waste heat from the power generation cycle.

PREREQUISITES

1. All instrumentation and electrical equipment associated with the CCW system has been tested and calibrated.

2. The main turbine condenser is operational.

3. The cooling tower is available with adequate water in the basin.

4. The CCW system is filled and vented.

TEST METHOD

1. Operate the CCW system with various pump configurations and verify pump hydraulic performance and proper flow to the condensers.

2. Verify all CCW components controls, interlocks and alarms function properly to actual or simulated signals.

ACCEPTANCE CRITERIA

1. Condenser Circulating Water system and components operate at design conditions in accordance with FSAR section 10.4.5 and associated design drawings.