14. INITIAL TEST PROGRAM

14.1 SPECIFIC INFORMATION TO BE INCLUDED IN PRELIMINARY SAFETY ANALYSIS REPORTS

This information was included in the KNU 5 and 6 PSAR.

14.2 SPECIFIC INFORMATION TO BE INCLUDED IN THE FINAL SAFETY ANALYSIS REPORT (FSAR)

14.2.1 SUMMARY OF TEST PROGRAM AND OBJECTIVES

The comprehensive Initial Test and Operation Program at Korea Nuclear Units 5 and 6 (KNU 5 and 6) is established by the requirements of 10 CFR 50, Appendix B, to ensure that:

A. The equipment and systems perform in accordance with design criteria.

B. The initial fuel loading is accomplished in a safe and efficient manner.

C. The nuclear parameters are verified.

D. The unit can be brought to rated capacity in accordance with safety requirements established by this FSAR.

The initial test program for each unit encompasses the scope of events that commences with completion of component/system installation for initial test run and terminates with the completion of power ascension testing and performance warranty tests. It is divided into three phases:

A. Phase I - Construction Completion and Testing

B. Phase II - Preoperational Testing

C. Phase III - Initial Startup Testing

   1. Initial fuel loading and zero power testing.

   2. Low-power physics testing.

   3. Power ascension testing.

14.2.1.1 Construction Completion Phase

The construction completion phase is defined as a part of the initial test program that commences with the completion of system/component installation and terminates with system turnover from Construction. In this phase, tests are performed by construction with technical assistance of Westinghouse, General Electric Corporation, Ltd. (GEC), vendors, and/or Bechtel (depending on design responsibility).

The construction completion phase testing includes, but is not limited to, the following items:

A. Component pressure tests (hydro/air)

B. Clean and inspect piping and equipment (flushing and blowing)

C. Megger and high-potential tests.

D. Adjustments of mechanical equipment, such as realignment, greasing, and tightening of bolts.

E. Checking and adjusting relief and safety valves.

F. Checking and adjusting piping system supports and snubbers.

G. Perform motor rotation tests.

14.2.1.2 Preoperational Phase

The preoperational (preop) phase commences with component/ system turnover from Construction and terminates with initial fuel loading. The preop phase consists of construction acceptance tests and the preoperational tests. The construction acceptance tests are the prerequisite component tests and are conducted prior to the formal preoperational test. During acceptance testing, components are tested individually. During the preop test, components are tested together as a system for the first time.

The construction acceptance testing includes, but is not limited to, the following:

A. Containment local leak rate tests.

B. Cleanness verification.

C. Electrical system tests, including energization; e.g., grounding checks, relay checks, circuit breaker operation and control checks, continuity checks and phasing checks.

D. Initial alignment and bumping of motors.

E. Initial run testing includes measuring motor current and voltage, bearing, lubricating oil, cooling water and seal temperatures, and vibration. These measurements are primarily of importance for equipment protection, and as a prerequisite for turnover for preoperational tests.

F. Check motor-operated valve torque switch vendor settings and adjust limit switches.

G. Initial component checkout and calibration.

The objectives of the preoperational tests are to:

A. Confirm that construction is complete and acceptable.

B. Adjust, calibrate, and balance equipment, instruments, and systems and check or set initial trip points to the extent possible, in the cold plant.

C. Assure that all process and safety equipment is operational to the extent necessary to proceed into fuel loading and the power ascension phase.

D. Prove that design objectives and criteria are met.

E. Show compliance with regulations and codes.

F. Provide documentation of the performance and safety of systems and equipment.

G. Provide baseline data on systems and equipment for Korea Electric Power Company's (KHNP 's) future use. 554

H. Wear-in and run-in of new equipment for a sufficient period of time to correct any design, manufacturing, or installation defects.

I. Assure that plant systems operate together on an integrated basis to the extent possible without a fueled reactor.

J. Demonstrate, to the extent possible, that the station is capable of operating satisfactorily and safely.

K. Allow plant operating staff, and technical and maintenance personnel the maximum opportunity to obtain practical experience and become familiar with the plant characteristics, location of equipment, troubleshooting, etc.

L. Establish, exercise, and finalize safe and efficient operating procedures.

M. Establish and evaluate the adequacy of surveillance testing procedures.

O. Check control and interlock functions of instruments, relays, and control devices.

SPECIFIC INFORMATION TO BE
INCLUDED IN THE FSAR

14.2.1.3 Initial Fuel Loading and Power Ascension Phase

The power ascension phase is a part of the initial test program which commences with the start of nuclear fuel loading and terminates with the completion of power ascension test and the performance of warranty tests. These tests confirm the design basis and demonstrate, to the extent practicable, that the plant operates and responds to anticipated transients and postulated accidents as designed. Power ascension testing is sequenced so that the safety of the plant is never dependent upon the untested structures, systems, or components. The completion of power ascension testing constitutes completion of phase I, II, and III of the initial test program. The objectives of the power ascension test are to:

A. Accomplish a controlled, orderly, and initial core loading.

B. Accomplish a controlled, orderly, and safe initial criticality.

C. Conduct low-power testing sufficient to ensure that design parameters are satisfied and safety analysis assumptions are correct or conservative.

D. Perform a controlled, orderly, and safe power ascension with requisite testing terminating at plant rated conditions.

14.2.2 ORGANIZATION AND STAFFING

14.2.2.1 KRN 3 and 4 Startup Organization 554

The Startup organization has the responsibility and authority to conduct all startup testing for Kori Nuclear Units 3 and 4. The Startup organization is directed by the KHNP startup manager who reports directly to the site manager for matters relating to phase II testing. For matters relating to phase III testing, the startup manager reports to the plant manager. Startup is a composite of KHNP, Bechtel, Westinghouse and General Electric Corporation (GEC) startup engineers. Figures 13.1-2 and 14.2-2 illustrate the KRN 3 and 4 plant staff and startup organizations and their interrelationships. 554

14.2.2.2 Test Working Group

Prior to preoperational and initial startup testing, a test working group (TWG) is formed to perform the administrative control performance of the entire Initial Test Program.

The chairman of the TWG has overall responsibility for the entire Initial Test Program. The TWG consists of the following members:

A. Chairman - KRN 3 and 4 Startup Manager 554

B. KHNP Group Manager

C. BII Project Startup Manager

D. Westinghouse Startup Manager

E. Quality Assurance Manager

The responsibilities of the TWG are:

A. Policy making, announcement, and direction.

B. Overall management coordination.

C. Approve major plans during phase II testing and monitoring actual progress.

D. Meet, as required, to ensure the safety and proper sequencing of the test program during phase II

E. Resolve major test problems.

F. Ensure that the test program is conducted in accordance with approved test procedures and plant operation manual.

G. Approve major changes to test procedures.

H. Review and approve the results of tests performed during phases II.

I. Ensure that all test deficiencies are resolved.

J. Recommend modifications of system design, equipment, or operation manual based on the evaluation of the test results.

14.2.2.3 Plant Manager

The plant manager is responsible for implementation of the phase III test programs and for safe plant operation for all phases. He is chairman of the plant operation review committee (PORC), which will assist the plant manager in reviewing the plant operation manual, test procedures, and test results during phase III testing. He reviews and approves the phase III test procedures.

14.2.2.4 KHNP Startup Manager

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The KHNP startup manager has complete authority to control the conduct of the Initial Test Program, phase II, through acceptance and rejection of test procedures and results, by establishing and enforcing administrative controls and policies, and through general surveillance of startup activities. The KHNP startup manager is delegated the responsibility for the administration and control of the startup organization. He ensures the review of all test results and accepts or rejects them. He is responsible for the production of all test procedures. He coordinates requests for operations, maintenance, and construction staff support. 554

14.2.2.5 BII Startup Manager

The BII startup manager is responsible for consulting and assisting in all startup activities leading up to fuel loading. He has the following specific responsibilities:

A. Assist the KHNP startup manager in preparing schedules and managing all Bechtel startup activities. 554

B. Review selected component tests, preoperational tests and special tests.

C. Advise the KHNP startup manager in matters relating to the Startup program. 554

D. Assist in data reduction, analysis, and interpretation of test results.

E. Provide administrative support to the Bechtel personnel assigned for startup testing.

F. Act as a liaison with appropriate groups within the Bechtel Project Organization, where required. Expedite the resolution of problems or design questions with Bechtel.

14.2.2.6 Westinghouse Startup Manager

The Westinghouse startup manager is responsible to the KHNP startup manager for consulting and assisting in the NSSS startup testing. The Westinghouse startup manager has the following specific responsibilities: 554

A. Assist the KHNP startup manager in preparing schedules and managing NSSS startup activities. 554

B. Act as a liaison with Westinghouse on testing matters involving NSSS equipment.

C. Review selected component tests, preperational tests, special tests and initial startup tests.

D. Advise the KHNP startup manager in matters relating to initial startup testing. 554

E. Assist in data reduction, analysis, and interpretation of test results.

F. Provide administrative support to Westinghouse site personnel assigned to Startup.

14.2.2.7 GEC Startup Manager

The GEC startup manager is responsible to the KHNP startup manager for consulting and assisting in the turbine startup testing. The GEC startup manager has the following specific responsibilities. 554

A. Assist the KHNP startup manager in preparing schedules and managing turbine generator startup activities. 554

B. Act as a liaison with GEC on testing matters involving turbine equipment.

C. Review selected component tests, preoperational tests, special tests, and initial startup testing.

D. Advise the KHNP startup manager in matters relating to turbine startup testing. 554

E. Assist in data reduction, analysis, and interpretation of test results.

F. Povide administrative support to GEC site personnel assigned to startup.

14.2.2.8 Group Managers

The Group Managers are responsible to the KHNP startup manager for the conduct of Startup activities during phase II testing. They have the following specific responsibilities: 554

A. Maintain status of components/systems for their group.

B. Prepare and update system logic networks and test schedules.

C. Coordinate with the startup/construction coordination group for turnover of components/systems.

D. Coordinate the initial operation of equipment.

E. Review startup field reports and resolve test deviations.

F. Prepare test procedures.

G. Review and approve results of tests.

H. Coordinate vendor assistance, as necessary, to support testing.

14.2.2.9 Test Engineers

The test engineers, under the supervision of the group leaders, are responsible for conducting all preoperational test activities for the systems assigned to them. They have the following specific responsiblities:

A. Define preoperational test scope boundaries required to support testing.

B. Be totally familiar with all aspects of their assigned systems and be generally familiar with the systems assigned to the other test engineers in his group.

C. Provide detailed system test scheduling information to the group leader for assigned systems. Assist in developing detailed system logic networks and schedules.

D. Write, revise, and submit for approval preoperational test procedures for assigned systems.

E. Complete system prerequisites and conduct system tests in accordance with approved procedures. Assist other test directors in conducting their tests, as required.

F. Supervise and direct the activities of the KHNP operations and maintenance personnel assigned to them for testing. 554

G. Review operating, maintenance, and test procedures used in the course of testing. Suggest corrections and/or improvements, and assist in familiarizing plant operations and maintenance personnel with system features.

H. Reduce, analyze, and interpret test data. Prepare test reports, documents, and results for review and approval.

I. Participate in system walkdowns prior to turnover.

J. Initiate, track, and resolve system deficiencies and discrepancies via startup field reports.

K. Initiate, track, and resolve test changes and exceptions.

L. Provide on-the-job training of KHNP personnel on assigned systems. 554

M. Obtain concurrence to run all tests from the operations shift supervisor and keep the operations shift supervisor informed of status of tests and equipment.

14.2.2.10 Startup Scheduler

The startup scheduler, under the direction of the KHNP startup manager, is responsible for directing and coordinating the activities of the scheduling group. The startup scheduler has the following specific responsibilities: 554

A. Maintain the startup summary schedule, ensuring that it interfaces realistically with the construction schedule.

B. Maintain status of overall system testing to be performed.

C. Prepare weekly reports that identify problem areas that impact on the initial test program.

D. Interface with the group managers for input to the system logic networks and schedules.

14.2.2.11 Support Group Manager

The support group manager, under the direction of the KHNP startup manager, is responsible for activities associated with turnover. He has the following specific responsibilities: 554

A. Participate in construction turnover walkdowns and identify discrepancies.

B. Review discrepancies identified on turnover walkdowns and ensure their resolution

C. Review turnover packages received from Construction for acceptability.

D. Review operational turnover packages for completeness.

E. Provide scheduling input for components and systems turned over by Construction and for those systems turned over to operations.

F. Coordinate system/component work-arounds as required to support the Initial Test Program.

G. Coordinate green turnover tagging of components/system when turnover from Construction has been accepted.

14.2.2.12 Project Construction

The KRN 3 and 4 construction manager represents Hyundai in all matters relating to construction. He will provide Startup with construction support and information concerning construction progress, and will expedite startup requests for construction assistance or action. 554

14.2.2.13 KHNP Quality Assurance

KHNP Quality Assurance performs monitoring and audit functions during all testing phases. 554

14.2.2.14 KHNP Operations 554

Plant Operations personnel operate permanent plant equipment during testing. During phase II testing, the activities of the plant operators are controlled by the startup test personnel. Following completion of system preoperational testing and during phase III testing, the plant manager is responsible for conducting and coordinating fuel loading operations and startup tests.

Plant maintenance personnel will be used to provide craft support for testing to the extent practical.

The plant staff chemistry and radiation protection personnel are responsible for all chemical, radiochemical, and radiation protection activities required to support testing.

14.2.2.15 Project Engineering

Project Engineering provides technical assistance in reviewing test procedures, designs and services to satisfy special startup requirements; writes special test procedures to verify unique KRN 3 and 4 designs; analyzes and reviews test data and results; and provides design recommendations for any design-related deficiencies or discrepancies. If required, project design personnel may be assigned to Startup to lend their technical assistance. |554

14.2.2.16 GEC Startup Group

The GEC Startup Group includes the GEC startup manager and GEC startup engineers. The GEC startup manager is responsible for directing and supervising the GEC startup engineers according to the instructions of the KHNP startup manager. The GEC |554 startup manager is also responsible for sequencing the test program related to the turbine. He is a technical advisor to the KHNP startup manager. |554

14.2.2.17 Westinghouse Startup Group

The Westinghouse Startup Group includes the Westinghouse startup manager and Westinghouse startup engineers. The Westinghouse startup manager is responsible for directing and supervising the Westinghouse startup engineers according to the instructions of the KHNP startup manager. The West- |554 inghouse startup manager is also responsible for sequencing the test program related to the NSSS. He is a technical advisor to the KHNP startup manager and a member of the TWG. |554

The Westinghouse startup engineers are responsible for providing technical support to the test directors and serve as technical advisors. The Westinghouse startup engineers will review test procedures, test results, and plant operation manuals.

14.2.2.18 Qualification of Personnel

All personnel involved in the initial test program shall be qualified in accordance with training and indoctrination programs developed by KHNP. Qualification of plant personnel |554 is referenced in chapter 13.

14.2.2.19 Utilization of the Plant Staff

The plant operating staff will be utilized to the fullest extent practicable during the initial test program. The plant staff will operate all permanently installed and powered equipment for preoperational and subsequent tests. Plant service personnel, such as instrument, chemistry, and health physics technicians, will be used extensively to perform testing applicable to their fields of specialization.

The plant engineering staff will participate in the review of startup test procedures and plans, assist and coordinate in the performance of the tests as required, and participate in the analysis and review of test results.

14.2.3 TEST PROCEDURES

Phases II and III of the Initial Test Program are conducted in accordance with detailed preoperational and startup test procedures. KHNP maintains overall responsibility for test procedure preparation, review, and approval. These activities are completed as described in the following sections. 554

14.2.3.1 Procedure Preparation

Detailed test procedures will be prepared utilizing appropriate design disclosure documents. A test procedure will be prepared applying to each specific test performed during various evolutions of the Initial Test Program.

Test procedure drafts are initially prepared by designated organizations (Bechtel, Westinghouse, or others) in accordance with the format:

1.0 Objectives

2.0 Acceptance Criteria

3.0 References

4.0 Prerequisites

5.0 Precautions and Notes

6.0 Test Equipment

7.0 Initial Conditions

8.0 Procedure and Data Collection

9.0 System Restoration

10.0 Attachments

The completed drafts are then reviewed by cognizant design organization representatives to ensure that test procedure objectives and acceptance criteria are consistent with current design document requirements. Review comments are resolved between the writing organization and the design organization representative. Upon satisfactory resolution of comments, subsequent changes to test procedure objectives or acceptance criteria will be made to be consistent with approved design documents and design organization concurrence.

14.2.3.2 Procedure Review and Approval

Following initial preparation, test procedures are processed through a formal review and approval cycle. Individuals designated review responsibility are responsible for reviewing test procedures for total accuracy, technical content, conformance with FSAR requirements, and compatibility with approved design documents. Specific review responsibilities include the following:

A. Verifying that procedure references have been updated to latest revisions

B. Verifying that procedures have been revised to incorporate known design changes

C. Verifying procedure compatibility with field installation of equipment

D. Verifying procedure conformance with the FSAR and its amendments and technical specifications

E. Verifying that procedures reflect, as appropriate, reactor operating and testing experiences of similar power plants.

Upon completion of initial reviews and inclusion of required changes, test procedures are submitted to the startup manager for approval.

Test procedures revisions and procedure modifications are processed in accordance with paragraph 14.2.4.3.

14.2.4 CONDUCT OF TEST PROGRAM

The administrative controls that govern conduct of the plant staff and of the startup group during the Initial Test Program are specified by administrative procedures. These administrative procedures are KHNP controlled and approved documents. 554
Administrative procedures define tasks to be performed, prescribe methods, and assign responsibilities for performing the tasks.

The administrative procedures governing conduct of the startup group are contained in the Startup Administrative Manual. These procedures do not establish the administrative controls of other project groups or organizations except as they interface with the Startup group. The Startup Administrative Manual will be approved for use prior to start of the Initial Test Program.

The administrative procedures governing conduct of the plant staff are as specified in chapter 13. The schedule for preparation, review, and approval of these procedures is also described in chapter 13. This schedule provides sufficient time for procedures to be available for review and approval prior to the time they are required to be implemented.

14.2.4.1 Test Performance

Testing performed during the Initial Test Program is in accordance with approved test procedures. The methods for preparing, reviewing, and approving test procedures are detailed in subsection 14.2.3. Prior to start of testing, a test engineer is assigned to each procedure. The test engineer is the individual responsible for coordinating test performance. Test engineers are assigned from the startup group by the KHNP startup 554
manager or his designee. The test engineers are directed and supervised in technical matters by test group leaders in preparation and performance of the tests.

The plant operating staff is responsible for the safe and proper operation of equipment during testing. Should an unsafe condition arise, the plant operating staff shall take whatever action is necessary including, but not limited to, stopping the test in order to restore safe plant conditions. During power testing, the plant operating staff is specifically responsible for compliance with operating technical specifications, compliance with the provisions of the operating license, and authorization of testing.

14.2.4.2 Test Prerequisites

Specific test prerequisites are identified in each preoperational and power test procedure. The test engineer verifies that each prerequisite is completed and properly documented prior to signoff on the official test copy of the procedure. If a prerequisite cannot be satisfied, the test engineer may waive the prerequisite to expedite testing after making an exception list and receiving approval from the KHNP startup 554
manager. Waiving of a prerequiste is permissible only if the prerequisite has a minimal and definable effect on the test.

Waiving of a prerequisite constitutes a procedure modification; therefore, the test engineer is responsible for complying with the requirements of paragraph 14.2.4.3.

14.2.4.3 Procedure Modifications

Tests are to be conducted in accordance with approved procedures, but, if necessary, a procedure may be modified to complete the

testing. Such modifications are documented within the text of the procedure and on a special test change notice form. The test engineer marks up the official test copy of the procedure to clearly indicate the required change and initials and dates the change. For modifications to power test procedures, the change is also initialed and dated by a licensed senior operator. In addition, the test engineer prepares and processes a test change notice form and submits it to the KHNP startup manager 554
for approval. The test change notice form becomes an attachment to the official test copy of the procedure. Preparation, review, and approval activities are accomplished before or after performance of associated testing based on the following criteria:

A. For minor modifications that obviously preserve the intent of the test, the test change notice may be processed after performance of associated testing.

B. For major modifications that alter the intent of the test, the test change notice is processed before continuing performance of associated testing.

14.2.4.4 Design Problems

In the process of checkout, preliminary operation, and preoperational or power testing, design problems may be encountered. All such design problems are formally documented and reported to appropriate design organization representatives for resolution. Typical design problems include:

A. Errors or discrepancies in approved project design documents

B. Items that represent a potential hazard to personnel safety

C. Proposed facility modifications

D. Failure of a tested system or component to satisfy design requirements or acceptance criteria

E. Operating problems where operation is not in accordance with approved procedures.

Design response for all such reported items is mandatory. Should the response require a facility modification, the appropriate design documents are revised and issued to the field. Field implementation of the modification is subsequently controlled in accordance with paragraph 14.2.4.5.

14.2.4.5 Control of Rework, Modification, and Repair

A comprehensive listing of outstanding work items is maintained for each system during the Initial Test Program to ensure that identified work is performed. Typical work items listed include:

A. Incomplete or incorrect equipment installation

B. Equipment repairs (corrective maintenance)

C. Approved facility modifications

D. New or additional construction.

This work is performed by the Construction organization, the Plant Maintenance staff, or a contract organization in accordance with approved project procedures. In any event, in order to maintain the required controls, formal authorization is required to perform the work. This authorization is obtained through the implementation of appropriate administrative procedures. These administrative procedures, in addition to authorizing performance of the work, specifically identify any retesting required as a result of the work and document completion of both the work and the specified retesting. Closure of the associated work list item similarly requires completion of both the specified work and the specified retesting.

14.2.4.6 Test Phase Prerequisites

Completion of each major phase of the Initial Test Program is a prerequisite to starting the succeeding phase. Subsection 14.2.11 identifies the specific testing scheduled to be conducted during phases II and III. A phase is considered complete only after the results of required testing are evaluated, reviewed, and approved per the requirements of subsection 14.2.5.

14.2.5 REVIEW, EVALUATION, AND APPROVAL OF TEST RESULTS

KHNP has overall responsibility for review, evaluation, and approval of test results. The following paragraphs establish the requirements for review, evaluation, and approval of individual test results, major test phase test results, and power ascension test results. 554

14.2.5.1 Individual Test Results

Upon completion of testing, the test engineer assembles a test package that includes the official test copy of the procedure and all related documentation. Preoperational and power test packages are submitted to TWG members responsible for performing an in-depth review and evaluation of test results.

Test discrepancies, deficiencies, and omissions identified during testing or during review of test results are documented as a test deviation. Test deviations occurring because of design problems are reported to appropriate design organization representatives for resolution per paragraph 14.2.4.4. Following review and resolution of review comments, the TWG chairman has three options:

A. Recommend that the entire test be repeated.

B. Recommend rejecting the test results as unacceptable until all or part of the outstanding exceptions are resolved.

C. Recommend accepting the test results with or without exceptions.

Final approval of preoperational and startup test results is by the startup manager.

For procedures approved with deviation, each exception and deviation will be evaluated and assigned a required completion date relative to the different phases of the Initial Test Program. These test deviations are subsequently resolved by processing retest results through the same review and approval cycle.

14.2.5.2 Major Test Phase - Test Results

Commencement of initial fuel loading and zero power testing requires the results of the preoperational tests of designated systems in table 14.2-1 be reviewed and approved.

14.2.5.3 Power Ascension Testing - Test Results

Figure 14.2-4 prescribes the sequence of testing during the power ascension testing phase as a function of power level. Commencement of the power testing specified for each power level requires the power test results specified for the preceding level be reviewed and approved.

14.2.6 TEST RECORDS

A single copy of each approved procedure, denoted as the official test copy, is used as the official record of the test. The completed official test copy and all associated test documents are assembled into a test package at the end of testing. Test packages are retained for the life of the plant in accordance with KHNP procedures for retention of historical records. 554

Each test package contains, either as part of the procedure or as separate documentation, the following information:

A. A description of the test method and objectives.

B. A comparison of test data with acceptance criteria.

C. Deficiencies relating to design and construction identified during testing.

D. Modifications and corrective actions required and the schedule for their implementation.

E. Justification for acceptance of systems or components not in conformance with design predictions or performance requirements.

F. Conclusions regarding system or component adequacy.

14.2.7 CONFORMANCE OF TEST PROGRAMS WITH USNRC REGULATORY GUIDES

The Initial Test Program to be conducted at the KRN 3 and 4 is described in this chapter. This chapter establishes both the administrative and technical requirements of the test program. Implementation of the Initial Test Program shall be in accordance with these requirements. 554

This program was developed in accordance with the following positions as related to regulatory guides.

14.2.7.1 General Position - USNRC Regulatory Guides

The purpose of the regulatory guides, as related to testing, is to describe the scope and depth (administratively and technically) of an Initial Test Program acceptable for light water-cooled nuclear power plants. The basis for the regulatory guides is 10 CFR 50, Section 50.34, and Appendix B. These two items specifically apply to testing of structures, systems, and components important to safety, that is, testing sufficient to provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.

Structures, systems, and components important to safety are classified as safety-related and are identified in chapter 3. The remaining structures, systems, and components are considered as nonsafety-related, and plant design is based upon the concept that failure of a nonsafety-related structure, system, or component cannot jeopardize the health or safety of the public. Therefore, the regulatory guides, as related to testing, apply administratively and technically only to structures, systems, and components classified as safety related.

14.2.7.2 Specific Position - USNRC Regulatory Guides

Compliance with Regulatory Guides applicable to testing (Regulatory Guides 1.9, 1.20, 1.22, 1.30, 1.37, 1.40, 1.41, 1.52, 1.58, 1.68, 1.68.2, 1.68.3, 1.70, 1.79, 1.81, 1.82, 1.106, 1.108, 1.116, 1.118, 1.129, 1.139, 1.140, 1.143) is discussed in appendix 3A.

14.2.8 UTILIZATION OF REACTOR OPERATING AND TESTING EXPERIENCE IN THE DEVELOPMENT OF THE TEST PROGRAM

The TWG and the PORC are responsible for ensuring that reactor operating and testing experiences of similar power plants are utilized during the Initial Test Program. The primary sources of experience feedback material are the USNRC Licensee Event Reports sorted by system for 2 years preceding the Initial Test Program. The Plant Manager is responsible for disseminating this feedback material to individuals designated the responsibility for review of test and operation procedures. During their review of assigned test and operation procedures, TWG and SORC members are subsequently responsible for ensuring that pertinent feedback experiences are considered.

14.2.9 TRIAL-USE OF PLANT OPERATING AND EMERGENCY PROCEDURES

The schedule for preparation, review, and approval of plant operating and emergency procedures is specified in chapter 13. This schedule provides sufficient time for confirming procedure adequacy by trial-use during the Initial Test Program. Those procedures that do not require nuclear fuel are confirmed adequate during the Preoperational Test Program. Those procedures that require nuclear fuel are confirmed adequate during the Power Test Program.

The plant operating staff is responsible for confirmation of operating and emergency procedures. The plant manager is responsible for ensuring that comments/changes identified during confirmation are incorporated into finalized procedures.

It is not intended that preoperational and power test procedures reference plant operating and emergency procedures. These tests are intended to stand on their own since they are not necessarily compatible with configurations and conditions required for confirmation of facility operating and emergency procedures.

14.2.10 INITIAL FUEL LOADING AND INITIAL CRITICALITY

Core loading begins when all prerequisite system tests and operations are satisfactorily completed and the ROK-AEB operating license has been received. Upon completion of core loading, the reactor upper internals and pressure vessel head are installed and additional mechanical and electrical tests are performed. The reactor is then ready for its initial criticality. After the initial criticality, low power tests and power ascension tests will commence. The purpose of these tests is to verify the operational characteristics of the unit and core, to acquire data for the proper calibration of setpoints, and to ensure that reactor operation conforms to the license requirements.

14.2.10.1 Initial Fuel Loading

Before commencing initial fuel loading, the required phase II tests must be complete, the plant shall have an ROK-AEB operating license, and there must be an appropriately licensed operating staff. The plant manager is responsible for the conduct of initial fuel loading. Technical assistance will be provided by Westinghouse during the initial core loading operation. During this time, containment integrity and security must be maintained through the use of established procedures. The overall process of initial fuel loading is, in general, directed from the operating floor of the reactor building.

The as-loaded core configuration is specified as part of the core design studies conducted well in advance of plant startup, and as such is not subject to change at startup. In the event that mechanical damage is sustained during core loading operations by a fuel assembly of a type for which no spare is available onsite, an alternate core scheme whose characteristics closely approximate those of the initially prescribed pattern will be determined.

The core is assembled in the reactor vessel, submerged in water containing enough dissolved boric acid to maintain a calculated core-effective multiplication constant of 0.95 or lower. The refueling cavity is dry during initial core loading. Core moderator chemistry conditions (particularly boron concentration) are prescribed in the core loading procedure document, and are verified periodically by chemical analysis of moderator samples taken prior to, and during, core loading operation.

Initial fuel loading instrumentation consists of two permanently installed source range (pulse type) nuclear channels and two temporary incore source range channels, plus a third temporary channel that can be used as a spare. The permanent channels, when responding, are monitored in the control room by licensed plant operators; the temporary channels are installed in the containment structure and are monitored by fuel loading personnel. At least one permanent channel is equipped with an audible count rate indicator heard in the reactor building and the control room. Minimum count rates of two counts per second, attributable to core neutrons, are required on at least two of the four (i.e., two temporary and two permanent source range detectors) available nuclear source channels at all times following installation of the initial nucleus of eight fuel assemblies. A response check of nuclear instruments to a neutron source shall be performed within 8 hours prior to loading of the core, or resumption of loading if delay is for more than 8 hours.

At least two neutron sources are introduced into the core loading program to ensure a neutron population of a minimum of two counts/sec for adequate monitoring of the core.

Fuel assemblies, together with inserted components (control rod assemblies, burnable poison inserts, source spider, or thimble plugging devices), are placed in the reactor vessel one at a time according to a previously established and approved sequence that was developed to provide reliable core monitoring with minimum possibility of core mechanical damage. The core loading procedure documents include a detailed tabular check sheet that prescribes and verifies the successive movements of each fuel assembly and its specified inserts from its initial position in the fuel racks to its final position in the core. Multiple checks are made of component serial numbers and types at successive transfer points to guard against possible inadvertent exchanges or substitution of components, and fuel assembly status boards are maintained throughout the core loading operations.

An initial nucleus of eight fuel assemblies, the first of which contains a neutron source, is the minimum source-fuel nucleus that permits subsequent meaningful inverse count rate monitoring. This initial nucleus is determined by calculation and previous experience to be markedly subcritical (K_{eff} = 0.95) under the required conditions of loading.

Subsequent fuel additions are accompanied by detailed neutron count rate monitoring to determine that the count rate does not increase excessively, and that the extrapolated inverse count rate ratio is not decreasing for unexplained reasons. The results of each loading step are evaluated by KHNP personnel and technical advisors before the next fuel assembly is loaded into the reactor vessel. 554

Typical criteria for safe loading require that loading operations stop immediately if:

A. An unanticipated increase in the neutron count rates by a factor of two occurs on all responding nuclear channels during any single loading step after the initial nucleus of eight fuel assemblies are loaded (excluding an anticipated change due to detector and/or source movement).

B. The neutron count rate on any individual nuclear channel increases by a factor of five during any single loading step after the initial nucleus of eight fuel assemblies are loaded (excluding anticipated changes due to detector and/or source movements).

C. A change in boron concentration greater than 20 ppm is determined from two successive samples of reactor coolant system water until the change is explained.

D. An unexpected change in reactor vessel water temperature occurs greater than ± 10F.

E. The evacuation alarm coupled to one of the plant source range channels is activated.

F. Fewer than two of the nuclear channels being used for ICRR monitoring are in service.

G. Fewer than two of the nuclear channels being used for ICRR monitoring have counting rates of at least two counts per second after the initial nucleus of eight fuel assemblies are loaded in the vessel.

Detailed core loading procedures specify alignment of fluid systems to prevent inadvertent dilution of the reactor coolant and restriction of the movement of fuel to preclude the possibility of mechanical damage. The procedures also prescribe the conditions under which loading can proceed, identify chains of responsibility and authority, and provide for continuous and complete fuel and core component accountability.

14.2.10.2 Initial Criticality

Initial criticality typically is established by sequentially withdrawing the shutdown and control groups of control rod assemblies from the core, leaving the last withdrawn control group inserted far enough in the core to provide effective control when criticality is achieved, and then continuously diluting the heavily borated reactor coolant until the chain reaction is self-sustaining. Successive stages of control rod assembly group withdrawal and of boron concentration reduction are monitored by the following; observing changes in neutron of responsibility and authority, and provide for continuous and complete fuel and core component accountability.

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Primary safety reliance is based on inverse count rate ratio monitoring as an indication of the nearness and rate of approach to criticality of the core during control rod assembly group withdrawal and during reactor coolant boron dilution. The rate of approach is reduced as the reactor approaches extrapolated criticality to ensure that effective control is maintained at all times.

Detailed written procedures specify alignment of fluid systems to allow controlled starting, stopping, and adjustment of the rate of the approach to criticality. These procedures also identify chains of responsibility and authority during initial criticality.

14.2.11 TEST PROGRAM SCHEDULE

The schedule, relative to the initial fuel loading date, for conducting each major test phase of the Initial Test Program is presented in figure 14.2-1. This figure illustrates that the Preoperational Test Program is scheduled for 18 months duration for each unit and that the subsequent Power Test Program is scheduled for 6 months duration for each unit. Since Unit 6 fuel load is scheduled 12 months after Unit 5 fuel load, the Preoperational Test Programs will not overlap. However, if schedule compression occurs, the staffing and organization of the groups responsible for the Initial Test Programs will preclude significant divisions or dilutions of responsibility. Approved test procedures are intended to be available for ROK-AEB review at least 60 days prior to scheduled implementation.

The sequential schedule for conducting individual preoperational tests is presented in figure 14.2-3 for Unit 5. Unit 6 startup schedule is 12 months later. These sequential schedules offer one possible plan for an orderly and efficient progression of testing. While these sequences may be preferred, numerous acceptable alternatives exist because few preoperational tests are dependent on performance of other preoperational tests. The actual test sequences will be determined daily at the jobsite to reflect construction status, manpower availability, and test prerequisite status.

The sequential schedule for conducting Unit 5 and Unit 6 power tests is presented in figure 14.2-4. This schedule establishes the required order of power testing as a function of test phase and power level. Even though this basic order of testing is required, there is still considerable flexiblity in sequencing of the power tests specified to be conducted at each test
1 stage or power level. Detailed initial startup testing
schedules, commensurate with the requirements of this schedule,
1 will be developed at the jobsite to schedule initial startup
testing when operationally expedient.

14.2.12 INDIVIDUAL TEST DESCRIPTIONS

Each preoperational test to be conducted during the preoperational test program is presented in table 14.2-1. Each power test to be conducted during the subsequent Power Test Program is presented in table 14.2-2. Individual abstracts are presented to identify each test by title and number, describe the test objectives, specify the test prerequisites; provide a summary description of the test method, and establish the test acceptance criteria.

14.2.12.1 Preoperational Test Procedures

2 14.2.12.1.1 Main Steam System

14.2.12.1.1.1 Objective. Demonstrate proper operation of the main steam line drain valves and associated instrumentation.

14.2.12.1.1.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The main condenser is available to receive steam during hot functional testing.

14.2.12.1.1.3 Test Method

A. Verify the control logic of each main steam drain line valve.

B. Demonstrate the operation of all the main steam drain valves and traps.

14.2.12.1.1.4 Acceptance Criteria. Each steam drain line valve and trap operate within design specifications.

14.2.12.1.2 Power-Operated Relief Valves 2

14.2.12.1.2.1 Objective. Demonstrate proper operation of power-operated relief valves and related control circuits.

14.2.12.1.2.2 Plant Conditions Prerequisites

A. Required construction acceptance tests are complete.

B. Hot functional testing is in progress.

C. Required electrical power supplies and control circuits are available and operational.

14.2.12.1.2.3 Test Method

A. Verify operability of power-operated relief valve control circuits.

B. Verify operability of power-operated relief valve with related pressure controller.

C. Verify setpoints of the relief valves from vendor certification data or in-plant tests. (When verified by in-plant tests, setpoints are checked by using a pressure assist device.)

14.2.12.1.2.4 <u>Acceptance Criteria</u>. The power-operated relief valves operate at the selected set points as per design specification.

2 14.2.12.1.3 Main Steam Line Isolation Valves

14.2.12.1.3.1 <u>Objective</u>. Demonstrate the operability of the main steam line isolation valve and bypass valve during normal and emergency operating conditions.

14.2.12.1.3.2 <u>Plant Conditions and Prerequisites</u>

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The main steam line isolation valve accumulators are charged and associated hydraulic systems are operational.

1 D. Must be performed prior to and during hot functional testing.

14.2.12.1.3.3 <u>Test Method</u>. Initiate MSIS signal and verify the operation of the main steam isolation valve and bypass valve. Operate the main steam isolation valves and bypass valves from all local and remote points of control and verify operation of main steam isolation valves and bypass valves.

14.2.12.1.3.4 <u>Acceptance Criteria</u>

A. The main steam bypass valve operates as per design criteria upon receipt of MSIS signal.

B. The main steam isolation valves close upon receipt of MSIS signal and closure times are within design specifications.

C. Main steam isolation valves close and open upon actuation of manual signals and operating times recorded.

2 14.2.12.1.4 Main Steam Safety Valves

14.2.12.1.4.1 <u>Objective</u>. Verify the pressure relief setpoints of the main safety valves.

14.2.12.1.4.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Hot functional testing is in progress.

C. A source of compressed air is available to provide air to the air set pressure device installed on the valve under test.

14.2.12.1.4.3 Test Method. Main steam pressure is adjusted within the required range, and air is admitted to the air set pressure device on the safety valve under test. Actual lift pressure is calculated, using the steam pressure and converted air pressure at the time of lift. Setpoints of safety valves are verified from vendor bench test certification data.

14.2.12.1.4.4 Acceptance Criteria. Each main steam valve lifts within its respective setpoint tolerances.

14.2.12.1.5 Steam Dump System 2

14.2.12.1.5.1 Objective

A. To demonstrate the operability of the steam dump control system control circuits in both the average temperature and steam pressure modes of operation.

B. To demonstrate the operation of the main steam dump valves and main steam cooldown valves, including valve response to safety blocking signals.

14.2.12.1.5.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.5.3 Test Method

A. Operability of the steam dump control system control circuits is verified in both the average temperature and steam pressure modes.

B. Operability of the main steam dump valves' control circuits is verified, including valve response to turbine trip, low-low average temperature, and decreasing condenser vacuum signals.

C. Operability of the main steam cooldown valves' control circuits is verified, including valve response to low-low average temperature and turbine trip signals.

14.2.12.1.5.4 Acceptance Criteria. The response of the main steam dump valves and the main steam cooldown valves to the associated turbine trip, low-low average temperature, and decreasing condenser vacuum signals is in accordance with system design.

2 14.2.12.1.6 Moisture Separator Reheater System

14.2.12.1.6.1 Objectives

A. To demonstrate proper operation of the moisture separator reheater controls and associated instrumentation.

B. To demonstrate proper operation of the reheater vent steam valves.

C. To demonstrate proper operation of the reheating steam isolation and control valves.

14.2.12.1.6.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. Hot functional testing is in progress.

14.2.12.1.6.3 Test Method

A. During hot functional testing, operation of the moisture separator reheaters and associated valves is verified.

B. Reheater vent steam valves will be operated manually and automatically from all points of control. As the levels of the high pressure feedwater heater vary, the automatic mode will control the proper water level.

C. Blanketing steam valves and reheating steam valves modulate in response to the changes in temperature and pressure in the reheaters.

14.2.12.1.6.4 Acceptance Criteria

A. The moisture separator reheaters operate as designed.

B. The reheater vent steam valves, steam blanketing valves, and reheating steam supply isolation and control valves operate as designed.

14.2.12.1.7 Main Turbine 2

14.2.12.1.7.1 Objective. Demonstrate that the plant turbine is capable of operating in a safe and reliable manner.

14.2.12.1.7.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Permanently installed equipment is properly calibrated and operable.

C. Test instruments are properly calibrated and operable.

D. An adequate steam supply is available to operate turbine generator.

E. Turbine generator auxiliaries needed to operate the turbine generator are available and operational.

F. Required electrical power supplies and control circuits are available and operational.

G. Main condenser is available.

H. The circulating water system is available and operational.

I. Hot functional testing is in progress.

14.2.12.1.7.3 Test Methods. Roll turbine to synchronous speed with available steam source.

14.2.12.1.7.4 Acceptance Criteria. Demonstrate that vibration, eccentricity, and speed control are acceptable. Verify that turbine protective systems and control systems function as per design criteria. Verify the main turbine operates as per FSAR specifications.

2 14.2.12.1.8 Condensate System

14.2.12.1.8.1 Objective. Demonstrate the condensate pump's operating characteristics and verify the operation of system components and associated control circuits.

14.2.12.1.8.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The feedwater system is available to receive flow from the condensate pump discharge header.

D. The demineralized water system and the vacuum degasifier unit in the reactor makeup water system are available to provide a source of makeup to the condensate storage tank.

E. The condensate storage tank is available to provide makeup to the condenser hotwell.

F. The turbine plant closed cooling water system is available to provide cooling water to the condensate pump motor bearing oil coolers.

G. The compressed air system is available for air-operated valves.

H. Must be performed prior to hot functional testing.

14.2.12.1.8.3 Test Method. Condensate pumps and system components are tested and operated in a manual mode and all automatic functions are tested by operating the condensate system as per its design criteria.

14.2.12.1.8.4 Acceptance Criteria

A. The condensate pumps and associated valves such as condensate miniflow control valves and suction valves operate as per system design.

B. The condensate overboard system functions as per system design.

C. Condensate pumps automatic start protective features operate as per design specifications.

14.2.12.1.9 Main Feedwater System 2

14.2.12.1.9.1 Objectives

A. To demonstrate the operation of the feedwater system valves and to verify the response of the feedwater system valves to a feedwater isolation signal (FIS).

B. To perform the initial operation of the steam generator feedwater pumps (SGFP).

14.2.12.1.9.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The turbine plant closed cooling water system is available to provide cooling water to the SGFP lube oil coolers.

D. The compressed air system is available to provide air to system air-operated valves.

E. The steam seal system is available to provide seal steam and packing exhaust for SGFP turbines.

F. The main turbine is available for turning gear operation.

G. The condensate system is available to supply suction for the SGFPs.

H. The main condenser is available to receive SGFP turbine exhaust.

I. The auxiliary steam system is available to provide steam flow to the SGFP turbine.

J. Must be performed prior to hot functional testing.

14.2.12.1.9.3 Test Method

A. Feedwater system valves are operated, and the response of all system valves to a FIS is verified.

B. The SGFPs are operated as limited by steam, and operating data is recorded.

14.2.12.1.9.4 Acceptance Criteria

A. The steam generator feedwater isolation valves and feedwater chemical injection isolation valves close on receipt of an emergency actuation signal.

B. The closing time of the feedwater isolation valves is within design specifications.

C. Feed pumps operate as per design specifications.

2 14.2.12.1.10 Heater Drain System

14.2.12.1.10.1 Objectives. Demonstrate operability of heater drain system and major components such as heater drain pumps, high pressure and low pressure heaters, the respective level control and vent systems; 1st and 2nd stage reheater drain tanks; and associated level control and vent systems.

1

14.2.12.1.10.2 Plant Conditions and Prerequisites

A. An external water source to support heaters and reheater drain tank level control test is available.

B. The condensate system is available to receive water from heater drain pumps.

C. Required electrical power supplies and control circuits are available and operational.

D. Required construction acceptance tests and system cleaning are complete.

E. The condensate shaft seal water supply is available.

14.2.12.1.10.3 Test Method. Operate the heater drain system equipment from all points of control and verify the system operates as designed. 1

14.2.12.1.10.4 Acceptance Criteria

A. Heater drain pumps and major system components operate as per design criteria.

B. Heater drain system level controls function as per design criteria.

14.2.12.1.11 Condensate Demineralizer Regeneration System 2

14.2.12.1.11.1 Objectives

A. To demonstrate operation of the condensate demineralizer pumps, transfer pumps, and associated instrumentation.

B. To demonstrate operability of the condensate demineralizer tanks, bulk storage tanks, and associated instrumentation.

C. To demonstrate proper system capacity and water quality of the condensate demineralizer system.

14.2.12.1.11.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The condensate system is available to support the demineralizer system.

D. The service air system is available to provide required air to demineralizer system.

E. The condenser is available to receive rinse water from the demineralizer system.

14.2.12.1.11.3 Test Method

A. Operate system pumps under various system flow conditions to verify water chemistry and observe pump and system response.

B. Sample effluent water after startup and continued operation and record results.

14.2.12.1.11.4 Acceptance Criteria

A. System pumps and instrumentation operate properly and respond to varying conditions.

B. System tanks and instrumentation respond according to design.

C. Water effluent chemistry meets design specifications.

D. Demineralizer effluent capacity meets design specifications.

2 14.2.12.1.12 Demineralizer Neutralization System

14.2.12.1.12.1 Objectives

A. To demonstrate operation of neutralization sump pumps and recirculation and transfer pump.

B. To demonstrate proper operability of neutralization sump and tank and associated instrumentation.

C. To demonstrate proper operation of neutralization system.

14.2.12.1.12.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The condensate system is available to support the neutralization system.

D. The demineralizer regeneration system is available to support neutralization system.

14.2.12.1.12.3 Test Method

A. Operate the recirculation and transfer pump and sump pumps in manual and automatic mode from all points of control.

B. Sample effluent of neutralization tank.

14.2.12.1.12.4 Acceptance Criteria

A. Sump pumps, recirculation and transfer pump, and associated instrumentation operates according to design.

B. Neutralization sump, tank, and associated instrumentation function according to design.

C. Effluent of neutralization tank conforms to design specifications.

14.2.12.1.13 Auxiliary Feedwater System (Motor-Driven Pumps) 2

14.2.12.1.13.1 Objective. Demonstrate the operability of the motor-driven auxiliary feedwater pumps, determine by full flow test their ability to supply water to the steam generators, and verify their response to safety signals. The operation of system motor-operated and air-operated valves, including their response to safety signals, is also verified.

14.2.12.1.13.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The condensate storage tank contains an adequate supply of demineralized water for the performance of this test.

D. The steam generators are available to receive water from the auxiliary feedwater system.

E. The main steam generator blowdown system is available to maintain normal operating levels in steam generators during auxiliary feedwater pump test.

14.2.12.1.13.3 Test Method

A. Performance characteristics of the motor-driven feedwater pumps are verified while discharging to the steam generators.

B. System component control circuits are verified, including the operation of the motor-driven pumps and system valves on receipt of safety signals.

14.2.12.1.13.4 Acceptance Criteria

A. Motor-driven auxiliary feedwater pump performance characteristics must be within design specifications.

B. Motor-driven auxiliary feedwater pumps automatically start on receipt of an auxiliary feedwater signal (AFS).

14.2.12.1.14 Auxiliary Feedwater System (Turbine-Driven Pump)

2 14.2.12.1.14.1 Objectives

A. To verify the auxiliary feedwater pump air-operated steam supply isolation valve automatic operation on an auxiliary feedwater signal (AFS).

B. To perform the initial coupled operation of the turbine-driven auxiliary feedwater pump. Full flow characteristics of the turbine-driven pump will be demonstrated during hot functional testing.

14.2.12.1.14.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The steam generators are available to receive water from the auxiliary feedwater pumps.

D. The steam generator blowdown system is available to maintain the normal operating levels in the steam generators during auxiliary feedwater pumps.

E. The auxiliary steam system or main steam system is available to supply steam to the auxiliary feedwater pump turbine.

F. For the performance characteristic test of this pump, hot functional testing is in progress.

G. The condensate storage tank is available to supply water to the pump.

14.2.12.1.14.3 Test Method

A. When an AFS is initiated, opening of the air-operated steam supply isolation valve is verified.

B. The turbine-driven auxiliary feedwater pump is operated from the auxiliary steam system or main steam system, and during hot functional testing performance characteristics are recorded.

14.2.12.1.14.4 Acceptance Criteria

A. The auxiliary feedwater pump air-operated steam supply isolation valve opens automatically on an AFS.

B. Operating characteristics of the turbine-driven auxiliary feedwater pump are in accordance with the design.

14.2.12.1.15 Raw Water System 2

14.2.12.1.15.1 Objectives

A. To demonstrate the ability of the raw water treatment system to make water at acceptable quality and quantity levels and verify operation of its related components and control functions.

B. To demonstrate operability of service water pumps and service water system.

14.2.12.1.15.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operable.

C. A source of raw water is available.

14.2.12.1.15.3 Test Method

A. Operate the raw water treatment plant in a normal operating mode. Verify operability of related control circuits.

B. Operate service water pumps to verify pressure and operation of relative automatic and manual control circuits.

14.2.12.1.15.4 Acceptance Criteria. The ability of the raw water system to produce water at acceptable quantities and quality levels is as per design specifications.

2 14.2.12.1.16 Makeup Water Demineralizer System

14.2.12.1.16.1 Objectives

A. To demonstrate operation of the makeup water demineralizer pumps, transfer pumps, and associated instrumentation.

B. To demonstrate operability of the makeup water demineralizer tanks, bulk storage tanks, and associated instrumentation.

C. To demonstrate proper output of makeup water demineralizer system.

14.2.12.1.16.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The raw water system is available to supply water.

D. Instrument air is available to supply air for controls.

E. A discharge tank or sump is available to receive regenerant waste from regenerant waste sump.

14.2.12.1.16.3 Test Method

A. Operate system pumps, show changes in demand or concentration of chemistry, and observe pump and system response.

B. Sample output water after start, and continued operation.

14.2.12.1.16.4 Acceptance Criteria

A. System pumps and instrumentation operate properly and respond to varying conditions within the design.

B. System tank and instrumentation respond according to design.

C. Water effluent chemistry meets design specifications.

14.2.12.1.17 Condensate Transfer and Storage System 2

14.2.12.1.17.1 Objective. Demonstrate proper operation of condensate transfer and storage pumps, valves, and associated instrumentation.

14.2.12.1.17.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. A source of water is available in the condensate storage tanks.

D. A container is available to receive discharge of condensate transfer and storage pumps.

14.2.12.1.17.3 Test Method. Operate the pumps and verify that the pump and instrumentation operate in normal and automatic modes.

14.2.12.1.17.4 Acceptance Criteria. The pumps and instrumentation operate in accordance with the design specification.

2 14.2.12.1.18 Condensate and Feedwater Chemical Control System

14.2.12.1.18.1 Objective. Demonstrate the ability of the hydrazine and ammonia pumps to inject chemicals into the condensate and feedwater system. The ability of the chemical control system to control the chemical parameters of the condensate and feedwater systems will be accomplished during hot functional testing.

14.2.12.1.18.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.18.3 Test Method. Operate the chemical pumps in the manual and automatic mode and verify proper operation.

14.2.12.1.18.4 Acceptance Criteria

A. The chemical feed pumps' capacity can be varied to maintain steam generator chemistry within design specification.

B. The control circuits maintain chemical balance with system parameters during hot preoperational testing and layup condition.

2 14.2.12.1.19 Steam Generator Layup Chemistry Control System

14.2.12.1.19.1 Objective. Demonstrate the ability to add ammonia or hydrazine to the steam generators and the ability to recirculate the water in the steam generators.

14.2.12.1.19.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. Steam generators are prepared to be placed in layup condition with proper chemistry control.

14.2.12.1.19.3 Test Method. Add appropriate wet layup chemicals to steam generators. Recirculate each generator, and record pump performance characteristics and system response. Perform steam generator water samples and change concentrations in steam generators during wet layup conditions.

14.2.12.1.19.4 Acceptance Criteria. Chemicals can be added to the steam generators. The steam generator water can be recirculated in accordance with design specifications.

14.2.12.1.20 Reactor Coolant System Hot Functional Outline 2

14.2.12.1.20.1 Objectives

A. Specify the required Phase II tests to be performed during hot functional testing, and provide a sequencing framework for performance of these tests.

B. Verify proper operation of the reactor coolant pumps (RCP) under varying plant conditions.

C. Verify proper operation of the reactor coolant system (RCS) and associated system in performing the evolutions required to bring the plant from a cold shutdown condition to normal operating pressure and temperature, and to then return the plant to a cold shutdown condition.

14.2.12.1.20.2 Plant Conditions and Prerequisites

A. Reactor coolant system and supporting system valve lineups for normal operation completed and normal flow paths established.

B. Reactor coolant system cold hydrostatic test completed.

C. Preoperational and acceptance tests completed as necessary.

D. Instrumentation and control checkouts and calibrations completed as necessary.

E. Secondary system ready to receive steam and return feedwater to the SGs.

F. Diesel generators are operable, and batteries and battery chargers are in service.

G. Systems completed to the extent necessary to allow conduct of this test.

14.2.12.1.20.3 Test Method

A. Conduct Phase II tests per the sequencing framework in the approved test procedure.

B. Operate RCPs under varying plant conditions as required to support heatup and cooldown of the RCS.

C. Demonstrate the ability of the RCS and associated systems to perform the evolutions required to bring the plant from a cold shutdown condition to normal operating pressure and temperature, and to then return the plant to a cold shutdown condition.

14.2.12.1.20.4 Acceptance Criteria

A. Acceptance criteria for individual Phase II tests conducted during hot functional will be specified in section 2 of each individual test procedure.

B. Reactor coolant pumps operate in the modes and for the times required to meet the requirements specified in the detailed test procedure.

C. The RCS and associated systems perform the evolution required to bring the plant from a cold shutdown condition to normal operating pressure and temperature, and to then return the plant to a cold shutdown condition satisfactorily in accordance with the plant operating procedures.

2 14.2.12.1.21 Pressurizer Relief Tank

14.2.12.1.21.1 Objective. Demonstrate the appropriate spray flow rates, level and pressure alarms, pressure regulation, valve interlocks.

14.2.12.1.21.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.21.3 Test Method

A. Verify the cooling spray flow rate.

B. Verify the high and low level and high pressure alarms and valve interlocks.

14.2.12.1.21.4 Acceptance Criteria. The pressurizer relief tank operates in accordance with the design specifications.

14.2.12.1.22 Reactor Coolant Pump Standpipe Flow | 2

14.2.12.1.22.1 Objective. Verify and demonstrate the level control and alarm functions.

14.2.12.1.22.2 Plant Conditions and Prerequisites

A. Required electrical power supplies and control circuits are operational.

B. Must be performed prior to hot functional testing.

14.2.12.1.22.3 Test Method. Standpipe level control function is checked by drain and makeup.

14.2.12.1.22.4 Acceptance Criteria. Level control and alarm function are satisfactory per the approved test procedure.

14.2.12.1.23 Resistance Temperature Detector Cross-Calibration | 2

14.2.12.1.23.1 Objective. Verify the proper response of reactor coolant resistance temperature detectors (RTD) and fixed incore thermocouples during hot functional testing.

14.2.12.1.23.2 Plant Conditions and Prerequisites

A. Reactor coolant RTDs and fixed incore thermocouples are installed and required Phase I testing is complete.

B. Hot functional testing is in progress.

14.2.12.1.23.3 Test Method. Test data will be recorded after reactor coolant temperature has stabilized at various plateaus during hot functional testing.

14.2.12.1.23.4 Acceptance Criteria. Reactor coolant RTDs and fixed incore thermocouple readings are within allowable tolerances at the various temperature plateaus during hot functional testing.

2 14.2.12.1.24 Reactor Vessel Head Vent Valves

14.2.12.1.24.1 Objective. Verify flow paths and valve operation for the reactor vessel head vent piping.

14.2.12.1.24.2 Plant Conditions and Prerequisites

A. The reactor vessel head vent system is installed and required Phase I testing is complete.

B. Hot functional testing is in progress.

C. The excess letdown heat exchanger is operable.

D. The pressurizer relief tank is operable.

14.2.12.1.24.3 Test Method. Demonstrate each flow path for the reactor vessel head vent system and proper operation of system valves.

14.2.12.1.24.4 Acceptance Criteria. Reactor vessel head vent system flow paths and valve operations are satisfactory per the approved test procedure.

2 14.2.12.1.25 Resistance Temperature Detector Loop Transport Time

14.2.12.1.25.1 Objectives

A. Verify proper flow rates in each reactor coolant loop RTD bypass loop.

B. Verify proper functioning of system alarms in each RTD loop.

14.2.12.1.25.2 Plant Conditions and Prerequisites

A. Resistance temperature detector bypass loop flow analysis has been completed and any flow-limiting orifices required have been installed.

B. Hot functional testing is in progress.

C. Flow instrumentation in each RTD bypass loop has been calibrated.

14.2.12.1.25.3 Test Method

A. Measure flow in each RTD bypass loop.

B. Simulate system alarm conditions to verify response of system alarm circuitry.

14.2.12.1.25.4 Acceptance Criteria

A. Flow rates in each RTD bypass loop are in accordance with design specifications.

B. Alarm circuits respond as required to simulated alarm conditions.

14.2.12.1.26 Pressurizer Pressure and Level 2

14.2.12.1.26.1 Objectives

A. Verify proper operation of the pressurizer pressure and level control system.

B. Verify proper operation of the pressurizer PORVs.

C. Verify proper functioning of alarm circuitry associated with the pressurizer pressure and level control systems.

14.2.12.1.26.2 Plant Conditions and Prerequisites

A. Hot functional testing is in progress.

B. The pressurizer relief tank is operable.

C. Instrumentation associated with the pressurizer pressure and level control system has been calibrated.

14.2.12.1.26.3 Test Method

A. Demonstrate proper response of the pressurizer pressure and level systems to variations of pressurizer pressure and level.

B. Demonstrate proper stroke time and valve closing for each pressurizer PORV.

C. System alarm conditions are simulated to demonstrate proper response of alarm circuitry.

14.2.12.1.26.4 Acceptance Criteria

A. Pressurizer pressure and level control systems respond to variations of pressurizer pressure and level in accordance with the approved test procedure.

B. Each PORV strokes open as required per design specifications, and closes as required per the approved test procedure.

C. Alarm circuits respond as required per the approved test procedure.

2| 14.2.12.1.27 Pressurizer Spray Control Valve

14.2.12.1.27.1 Objective. Position the pressurizer spray bypass valves to insure proper continuous pressurizer spray flow rates.

14.2.12.1.27.2 Plant Conditions and Prerequisites

A. Reactor coolant system cold hydrotest has been completed satisfactorily.

B. Pressurizer spray piping is insulated.

C. Hot functional testing is in progress.

D. Required instrumentation has been calibrated.

14.2.12.1.27.3 Test Method. Adjust the pressurizer spray bypass valves until temperatures in the pressurizer spray indicate a continuous flow through each pressurizer spray bypass valve.

14.2.12.1.27.4 Acceptance Criteria. Each pressurizer spray bypass valve has been positioned to maintain temperatures in each pressurizer spray line in accordance with the approved test procedure.

14.2.12.1.28 Reactor Coolant System Cold Hydro 2

14.2.12.1.28.1 Objective. Verify the integrity of the RCS pressure boundaries.

14.2.12.1.28.2 Plant Conditions and Prerequisites

A. The RCS is installed and required Phase I testing is complete.

B. Required Phase I and Phase II testing for auxiliary systems associated with the RCS is complete.

C. An adequate supply of water is available in the refueling water storage tank (RWST) to conduct the test.

D. The reactor internals and reactor vessel head are installed.

14.2.12.1.28.3 Test Method. Demonstrate satisfactory RCS integrity by using reactor coolant pumps (RCPs) to increase temperature as required for the test, and to then increase pressure to the required pressure.

14.2.12.1.28.4 Acceptance Criteria. No leakage from any welded joint within the hydrotest inspection boundaries.

14.2.12.1.29 Reactor Coolant Pumps Hot Functional Data Sheets 2

14.2.12.1.29.1 Objective. Record operating data for each RCP during hot functional testing.

14.2.12.1.29.2 Plant Conditions and Prerequisites

A. Instrumentation required to monitor RCP during operating parameters is installed and calibrated.

B. Hot functional testing is in progress.

14.2.12.1.29.3 Test Method. During hot functional testing, record RCP operating parameters at various temperature plateaus.

14.2.12.1.29.4 Acceptance Criteria. Operating parameters for each RCP are within the limits described in the RCP technical manual and the approved test procedure.

2 14.2.12.1.30 Reactor Vessel Vibration Inspection

14.2.12.1.30.1 Objective. Verify the integrity of the reactor vessel internals.

14.2.12.1.30.2 Plant Conditions and Prerequisites. The reactor vessel internals have been cleaned and are not installed in the reactor vessel.

14.2.12.1.30.3 Test Method. Perform pre- and post-hot functional inspections on the reactor vessel internals.

14.2.12.1.30.4 Acceptance Criteria. The reactor vessel internals are structurally adequate and sound for operation per paragraph 3.9.2.5, and the approved test procedure.

2 14.2.12.1.31 Reactor Coolant System Leak Rate Test

14.2.12.1.31.1 Objective. Verify that unidentified leakage sources from the RCS are within technical specification limits.

14.2.12.1.31.2 Plant Conditions and Prerequisites

A. Hot functional testing is in progress.

B. Reactor coolant system temperature is stable while recording data for this test.

14.2.12.1.31.3 Test Method. Record makeup flow to the RCS and compare this with known leakage from the RCS.

14.2.12.1.31.4 Acceptance Criteria. Sources of unidentified leakage from the RCS are within technical specification limits.

14.2.12.1.32 Residual Heat Removal Pump Preoperational Test 2

14.2.12.1.32.1 Objective. Verify proper residual heat removal (RHR) pump performance and proper operation of RHR heat exchanger discharge and bypass valves.

14.2.12.1.32.2 Plant Conditions and Prerequisites

A. Residual heat removal system is installed and the required Phase I testing completed.

B. Refueling water storage tank is available and contains sufficient grade A water to perform this test.

14.2.12.1.32.3 Test Method

A. Record RHR pump data while recirculating through the return line to the RWST.

B. Demonstrate proper operation of the RHR heat exchanger discharge and bypass valves while recirculating through the RHR return line to the RWST.

14.2.12.1.32.4 Acceptance Criteria

A. RHR pumps provide adequate flows in accordance with section 6.3 and the approved test procedure.

B. RHR heat exchanger discharge and bypass valves operate satisfactorily in accordance with the approved test procedure.

14.2.12.1.33 Residual Heat Removal Valve Interlock 2

14.2.12.1.33.1 Objective. Verify proper operation of interlocks associated with valves in the RHR system.

14.2.12.1.33.2 Plant Conditions and Prerequisites. The RHR system is installed and the required Phase I testing is complete.

14.2.12.1.33.3 Test Method. Demonstrate proper operation of each interlock associated with valves in the RHR system.

14.2.12.1.33.4 Acceptance Criteria. Interlocks operate as described in section 6.3 and subsection 5.4.7, and the approved test procedure.

2 14.2.12.1.34 Residual Heat Removal Containment Sump Flow Test

14.2.12.1.34.1 Objective. Verify proper friction loss in the sump line to each RHR pump.

14.2.12.1.34.2 Plant Conditions and Prerequisites

A. Residual heat removal system is installed and required Phase I testing is completed.

B. The safety injection lines from the containment sump to the suction of the RHR pumps are installed and required Phase I testing is complete.

C. Sufficient water is available in the RWST to conduct this test.

D. A mechanical jumper is installed between the RHR containment sumps.

14.2.12.1.34.3 Test Method. Record pressure drop in each RHR containment sump line at the required flow rate.

14.2.12.1.34.4 Acceptance Criteria. Friction loss in each RHR containment sump line is less than the maximum allowed per subsection 6.2.2.

14.2.12.1.35 Low Head Safety Injection Flow Verification

2

14.2.12.1.35.1 Objective. To verify the following: proper flow rates in the cold leg injection mode; that each RHR pump reaches rated flow in the required time; proper functioning of system alarms; and to record valve stroking times.

14.2.12.1.35.2 Plant Conditions and Prerequisites

A. The RHR and applicable portions of the safety injection system are installed and required Phase I testing is complete.

B. Sufficient water is available in the RWST to conduct this test.

C. The reactor vessel head and reactor vessel internals are not installed.

14.2.12.1.35.3 Test Method

A. Each RHR pump is run to record flow rates in the cold leg injection mode, the time required to reach rated flow, and to record valve stroke times.

B. System alarm conditions are simulated to verify alarm circuitry.

14.2.12.1.35.4 Acceptance Criteria

A. Flow rates in the cold leg injection mode and the time to reach rated flow meet design requirements.

B. Alarm circuits respond as required to simulated alarm conditions.

C. Valve stroking times meet design specifications.

14.2.12.1.36 Charging/High Head Safety Injection Pumps Mini-Flow Verification 2

14.2.12.1.36.1 Objective. Verify proper mini-flow rates for the charging/high head safety injection (HHSI) pumps.

14.2.12.1.36.2 Plant Conditions and Prerequisites

A. The charging/HHSI pumps and associated piping is installed and required Phase I testing is complete.

B. Sufficient water is available in the RWST to conduct this test.

14.2.12.1.36.3 Test Method. Direct the miniflow from each charging/HHSI pump to the volume control tank and record level change to determine miniflow rate.

14.2.12.1.36.4 Acceptance Criteria. Each charging/HHSI pump's miniflow rate meets design specifications.

2 14.2.12.1.37 Makeup and Blending

14.2.12.1.37.1 Objective. Verify proper response of the makeup and blending system in the auto, borate, dilute, alternate dilute and manual modes. Verify interlocks and alarms associated with the volume control tank (VCT), and emergency borate operation.

14.2.12.1.37.2 Plant Conditions and Prerequisites

A. Volume control tank preoperational test has been completed satisfactorily.

B. Hot functional testing is in progress.

14.2.12.1.37.3 Test Method

A. Demonstrate that all activities associated with auto makeup, borate, dilute, alternate dilute, and manual happen in the proper sequence.

B. Demonstrate proper operation of interlocks and alarms associated with the VCT.

C. Demonstrate proper response of emergency boration equipment.

14.2.12.1.37.4 Acceptance Criteria

A. The makeup and blending system operates in accordance with design requirements in the auto, borate, dilute, alternate dilute and manual modes.

B. Interlocks and alarms respond as required in the approved test procedure.

C. Emergency boration operation meets design requirements.

14.2.12.1.38 Charging, Letdown, and Seal Injection 2

14.2.12.1.38.1 Objectives

A. Verify proper operation of the charging line flow control valve, and that charging flow can be routed through all charging line flow paths.

B. Verify proper flows through each letdown orifice line, and the proper pressure drop across the reactor coolant filter.

C. Verify proper operation of the letdown line temperature and pressure controllers.

D. Verify proper operation of the excess letdown and seal-water subsystems.

E. Verify proper flow rates and pressure drops for the mixed bed and cation bed demineralizers.

14.2.12.1.38.2 Plant Conditions and Prerequisites

A. Chemical and volume control (CVCS) system is installed and required Phase I testing is complete.

B. Reactor coolant system is at the conditions specified in the approved test procedure.

C. Associated systems completed to the extent necessary to allow conductance of this test.

14.2.12.1.38.3 Test Method

A. Demonstrate proper operation of the charging line flow control valve, and that charging flow can be routed through all charging line flow paths.

B. Adjust and lock throttle valves as necessary to demonstrate proper flows in each letdown line, and demonstrate proper pressure drop across the reactor coolant filter.

C. Demonstrate proper operation of the letdown line temperature and pressure controllers.

D. Demonstrate proper flows and flow paths for the excess letdown and seal-water subsystems.

E. Demonstrate proper flow rates and pressure drops for the mixed bed and cation bed demineralizers.

14.2.12.1.38.4 Acceptance Criteria

A. The charging line flow control valve performance is satisfactory per the approved test procedure, and the charging flow can be routed through all charging line flow paths to the RCS.

B. Letdown line flows and reactor coolant filter pressure drop meets design specifications.

C. Letdown line pressure and temperature controllers are in accordance with design specifications.

D. Excess letdown and seal-water subsystems flows and flow paths are satisfactory per the approved test procedure.

E. Flow rates and pressure drops for the mixed bed and cation bed demineralizers meet design specifications.

2 14.2.12.1.39 Volume Control Tank

14.2.12.1.39.1 Objectives

A. Verify the capability to makeup to the volume control tank (VCT) without operator action.

B. Verify proper operation of required VCT pressure control valves prior to RCS cold hydro.

14.2.12.1.39.2 Plant Conditions and Prerequisites

A. VCT and associated piping, reactor makeup water system, and required portions of the nitrogen system are installed and required Phase I testing has been completed.

B. Sufficient water available in the reactor makeup water storage tank to conduct this test.

C. Sufficient supply of nitrogen available to conduct this test.

14.2.12.1.39.3 Test Method. Demonstrate the capability to control VCT level and pressure with no operator action.

14.2.12.1.39.4 Acceptance Criteria. VCT level and pressure are maintained with proper specifications with no operator action in preparation for RCS cold hydro.

14.2.12.1.40 Boric Acid Transfer System | 2

14.2.12.1.40.1 Objectives

A. Verify proper pump performance of the boric acid transfer pumps.

B. Verify the capability of the boric acid transfer system to supply the charging pump suction header.

C. Verify the capability of the boric acid transfer pumps to deliver water from the batching tank to the boric acid storage tanks, and the ability to recirculate each boric acid tank.

D. Verify proper functioning of system alarms and interlocks.

E. Verify proper steam delivery to the boric acid batching tank.

14.2.12.1.40.2 Plant Conditions and Prerequisites

A. The boric acid transfer system is installed and required Phase I testing is complete.

B. An adequate supply of grade A water is available.

C. Steam supply is available to the batching tank.

14.2.12.1.40.3 Test Method

A. Record boric acid transfer pump data.

B. Demonstrate the capability of the boric acid transfer system to supply the charging pump suction header.

C. Demonstrate the capability of the boric acid transfer pumps to deliver water from the batching tank to the boric acid storage tanks, and the ability to recirculate each boric acid tank.

D. System alarm conditions are simulated to demonstrate the proper functioning of alarm circuitry, and the proper operation of interlocks associated with the boric acid transfer system.

E. Supply steam to the boric acid batching tank and demonstrate the ability to increase tank temperature.

14.2.12.1.40.4 Acceptance Criteria

A. Boric acid transfer pumps performance meets design specifications.

B. Boric acid transfer system supplies water to the charging pump suction header in accordance with design specifications.

C. Boric acid transfer pumps function properly in all required flow paths in accordance with the approved test procedure.

D. System alarms and interlocks respond in accordance with the approved test procedure.

E. Steam supply to the boric acid batching tank increases and maintains the temperature of the tank contents to the required temperature for boric acid batching.

2 14.2.12.1.41 Boron Thermal Regeneration System Functional Test

14.2.12.1.41.1 Objectives

A. Verify that system valves and equipment function as required in the borate and dilute modes.

B. Verify proper operation of the boron thermal regeneration system (BTRS) chiller water system.

C. Verify proper operation of alarms associated with the BTRS.

14.2.12.1.41.2 Plant Conditions and Prerequisites

A. The BTRS is installed and required Phase I testing is complete.

B. Sufficient demineralized water is available to fill the BTRS chilled water system.

14.2.12.1.41.3 Test Method

A. Demonstrate proper response of system valves and equipment when the BTRS selector switch is positioned to the borate and dilute positions.

B. Demonstrate proper flows and control valve operation in the BTRS chilled water system.

C. Simulate alarm conditions and demonstrate proper response of alarm circuitry.

14.2.12.1.41.4 Acceptance Criteria

A. System valves and equipment respond as required in the borate and dilute modes as specified in the approved test procedure.

B. Chiller pump performance meets design specifications, and chilled water control valve operation is in accordance with the approved test procedure.

C. Alarm circuits respond as required to simulated alarm conditions.

14.2.12.1.42 Boron Thermal Regeneration System Preoperational (Without Resin) 2

14.2.12.1.42.1 Objective. Verify that the BTRS flow and temperature in the borate and dilute modes are proper prior to loading resin in the BTRS demineralizers.

14.2.12.1.42.2 Plant Conditions and Prerequisites

A. The BTRS functional test has been completed satisfactorily.

B. Hot functional testing is in progress.

C. Resin has not been loaded into the BTRS demineralizers.

14.2.12.1.42.3 Test Method. Demonstrate during hot functional testing that the BTRS reduces the temperature at the outlet of the BTRS demineralizers as required in the dilute mode, and increases the temperature as required in the borate mode.

14.2.12.1.42.4 Acceptance Criteria. Temperature at the outlet of the BTRS demineralizers is reduced as required in the dilute mode, and increased as required in the borate mode, in accordance with the approved test procedure.

2 14.2.12.1.43 Boron Thermal Regeneration System Preoperational (With Resin)

14.2.12.1.43.1 Objective. Verify that the BTRS flows and temperature in the borate and dilute modes are proper after loading resin in the BTRS demineralizers.

14.2.12.1.43.2 Plant Conditions and Prerequisites

A. The BTRS preoperational test (without resin) has been completed satisfactorily.

B. Perform after core load.

C. The BTRS demineralizers are filled with resin.

14.2.12.1.43.3 Test Method. Demonstrate that the BTRS reduces the temperature at the outlet of the BTRS demineralizers as required in the dilute mode, and increases the temperature as required in the borate mode.

14.2.12.1.43.4 Acceptance Criteria. Temperature at the outlet of the BTRS demineralizers is reduced as required in the dilute mode, and increased as required in the borate mode, in accordance with the approved test procedure.

2 14.2.12.1.44 Boron Concentration Measurement System

14.2.12.1.44.1 Objective. Demonstrate proper operation of the boron concentration measurement system.

14.2.12.1.44.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.44.3 Test Method

A. Using external test equipment, simulate pulse input signals to the boronometer and monitor the boronometer output. Verify proper operation of the remote range indicators.

B. Verify proper operation of the boronometer test circuit.

14.2.12.1.44.4 Acceptance Criteria. The boron concentration measurement system operates in accordance with the design specifications.

14.2.12.1.45 Solid System Pressure Control 2

14.2.12.1.45.1 Objective. To verify proper operation of the low pressure letdown pressure control valve in order to maintain stable solid system pressure control.

14.2.12.1.45.2 Plant Conditions and Prerequisites

A. Reactor coolant system is filled.

B. Charging and letdown flow are in operation as required for plant conditions.

C. The RHR system is lined up with RCS and is in operation.

14.2.12.1.45.3 Test Method. Demonstrate proper operation of the low pressure letdown pressure control valve while the RCS is solid.

14.2.12.1.45.4 Acceptance Criteria. The low pressure letdown pressure control valve maintains solid system pressure control as required in the approved test procedure.

2 **14.2.12.1.46 Refueling Water Storage Tank Suction Header Capacity Test**

14.2.12.1.46.1 Objective. To demonstrate adequate sizing and layout of the RWST suction header.

14.2.12.1.46.2 Plant Conditions and Prerequisites

A. The two RHR pumps, two containment spray pumps, and the three charging/HHSI pumps are capable of being run at full flow.

B. Sufficient water is available in the RWST to conduct this test.

14.2.12.1.46.3 Test Method. Run two RHR pumps, two containment spray pumps, and three charging/HHSI pumps at full flow simultaneously while taking suction from the RWST, and record pressure and flow data for each pump.

14.2.12.1.46.4 Acceptance Criteria. Each RHR pump, containment spray pump, and charging/HHSI pump produces the required flows and pressures with all pumps operating simultaneously.

2 **14.2.12.1.47 Safety Injection Containment Sump Valves Auto Switchover**

14.2.12.1.47.1 Objective. To verify proper opening of the safety injection (SI) containment sump valves for the switchover from the injection mode to the recirculation mode.

14.2.12.1.47.2 Plant Conditions and Prerequisites

A. Required Phase I testing on the SI containment sump valves and RWST level instruments is completed.

B. Precautions have been taken to preclude flooding the containment building when the SI sump isolation valves are open.

14.2.12.1.47.3 Test Method. Demonstrate proper opening of the SI containment sump valves in response to required inputs.

14.2.12.1.47.4 Acceptance Criteria. Safety injection containment sump valves open automatically as described in section 6.3.

14.2.12.1.48 Charging/High Head Safety Injection Pump Curve 2

14.2.12.1.48.1 Objective. To verify proper charging HHSI pump performance and operation of system alarms associated with the HHSI system.

14.2.12.1.48.2 Plant Conditions and Prerequisites

A. The reactor vessel head and internals are not installed.

B. Sufficient water available in the RWST to conduct the test.

C. High head safety injection system is installed and the required Phase I testing is complete.

14.2.12.1.48.3 Test Method

A. Run each charging HHSI pump at various flow rates into the reactor vessel and record pump curve data.

B. Demonstrate proper functioning of HHSI system alarms.

14.2.12.1.48.4 Acceptance Criteria

A. Charging HHSI pumps provide adequate flows in accordance with section 6.3 and the approved test procedure.

B. System alarms respond properly in accordance with the approved test procedure.

14.2.12.1.49 High Head Safety Injection Flow Balance 2

14.2.12.1.49.1 Objective. Balance flows in each line for the high head cold leg injection flow path, the cold leg recirculation flow path, and the two hot leg recirculation flow paths.

14.2.12.1.49.2 Plant Conditions and Prerequisites

A. The reactor vessel head and internals are not installed.

B. Sufficient water available in the RWST to conduct the test.

14.2.12.1.49.3 Test Method. Run the charging HHSI pumps through each of the four flow paths, and adjust the throttle valves in each line to the required position.

14.2.12.1.49.4 Acceptance Criteria. Throttle valves in each branch line are adjusted to balance the flows, and then locked in position in accordance with design requirements.

2 14.2.12.1.50 High Head Safety Injection Recirculation Mode Flow Verification

14.2.12.1.50.1 Objective. Verify proper LHSI and HHSI pump flow rates in the cold leg and hot leg recirculation modes.

14.2.12.1.50.2 Plant Conditions and Prerequisites

A. The reactor vessel head and internals are not installed.

B. Sufficient water available in the RWST to conduct the test.

C. The branch line flows in the HHSI system have been balanced.

14.2.12.1.50.3 Test Method. Run the LHSI and HHSI pumps in simulated hot leg and cold leg recirculation modes.

14.2.12.1.50.4 Acceptance Criteria. The LHSI and HHSI pump flow rates meet design specifications in the simulated hot and cold leg recirculation modes.

2 14.2.12.1.51 Boron Injection Recirculation System

14.2.12.1.51.1 Objective. Verify proper operation of the boron injection recirculation system and alarms associated with the boron injection recirculation system.

14.2.12.1.51.2 Plant Conditions and Prerequisites

A. The boron injection recirculation system is installed and required Phase I testing is complete.

B. Boron injection tank and the boron injection recirculation system are filled with water.

14.2.12.1.51.3 Test Method

A. Recirculate the boron injection tank using the boron injection recirculation system and record operating pump data.

B. Demonstrate proper functioning of boron injection recirculation system alarms.

14.2.12.1.51.4 Acceptance Criteria

A. Operating pump data meets the requirements of section 6.3 and the approved test procedure.

B. System alarms respond in accordance with the approved test procedure.

14.2.12.1.52 Accumulator Blowdown 2

14.2.12.1.52.1 Objectives

A. Obtain data during safety injection accumulator blowdown.

B. Verify proper accumulator injection capability.

14.2.12.1.52.2 Plant Conditions and Prerequisites

A. The safety injection accumulators and associated piping are installed and the required Phase I testing is complete.

B. The reactor vessel head and reactor vessel internals are not installed.

14.2.12.1.52.3 Test Method. Pressurize each accumulator and then open the accumulator discharge isolation valve while recording accumulator level, pressure, and valve response time.

14.2.12.1.52.4 Acceptance Criteria. Valve opening times and accumulator blowdown rates satisfy design requirements.

2 14.2.12.1.53 Accumulator Discharge Valve

14.2.12.1.53.1 Objective. Verify that each safety injection accumulator discharge valve opens with maximum expected differential pressure across the seat.

14.2.12.1.53.2 Plant Conditions and Prerequisites

A. Nitrogen system is available to pressurize each safety injection accumulator.

B. The reactor vessel head and reactor vessel internals are not installed.

14.2.12.1.53.3 Test Method. Pressurize each safety injection accumulator to its maximum normal operating pressure, and then open the accumulator discharge valve.

14.2.12.1.53.4 Acceptance Criteria. Each accumulator discharge valve opens against maximum normal operating pressure in the required time.

2 14.2.12.1.54 Accumulator Level

14.2.12.1.54.1 Objectives

A. Verify proper correlation between actual and indicated accumulator level.

B. Verify operation of system alarms associated with the safety injection accumulators.

14.2.12.1.54.2 Plant Conditions and Prerequisites

A. Required instruments and alarms required for this test have been installed and calibrated.

B. There is water in the safety injection accumulators and previsions have been made for adjusting the water level as required for this test.

14.2.12.1.54.3 Test Method

A. Adjust the water level in each safety injection accumulator, and demonstrate proper correlation between actual and indicated accumulator level.

B. Demonstrate proper functioning of alarms associated with the safety injection accumulators.

14.2.12.1.54.4 Acceptance Criteria

A. The correlation between actual and indicated accumulator level meets the requirements of the approved test procedure.

B. System alarms respond properly in accordance with the approved test procedure.

14.2.12.1.55 Safety Injection Hot Preoperational | 2

14.2.12.1.55.1 Objectives

A. Verify proper operation of check valves in the safety injection system (SIS).

B. Verify operability of the automatic opening feature of the accumulator discharge valves.

14.2.12.1.55.2 Plant Conditions and Prerequisites. Hot functional testing is in progress.

14.2.12.1.55.3 Test Method

A. Perform a leak test and operability test on check valves in the SIS.

B. Demonstrate the automatic opening feature of the accumulator discharge valves.

14.2.12.1.55.4 Acceptance Criteria

A. Leak test and operability test results meet design specifications and the requirements of the approved detailed test procedure.

B. The automatic opening feature of the safety injection accumulator discharge valves operates as described in section 6.3.

2 14.2.12.1.56 Boron Injection Recirculation Preoperational

14.2.12.1.56.1 Objective. Verify the ability of the heat tracing system to maintain proper temperature in the boron injection tank and associated piping.

14.2.12.1.56.2 Plant Conditions and Prerequisites

A. Heat tracing system is installed and the required testing has been completed.

B. Boron injection tank and associated recirculation system are operable.

14.2.12.1.56.3 Test Method. Demonstrate that the heat tracing system maintains proper temperature in the boron injection tank and associated piping during recirculation operations.

14.2.12.1.56.4 Acceptance Criteria. Proper temperatures are maintained in the boron injection tank and associated piping during recirculation operations per section 6.3 and the approved test procedure.

2 14.2.12.1.57 Safety Injection Check Valves

14.2.12.1.57.1 Objectives

A. Perform tests on check valves in the safety injection system (SIS).

B. Insure proper operation of these valves during hot functional testing.

14.2.12.1.57.2 Plant Conditions and Prerequisites

A. Safety injection check valves are installed and the required Phase I testing is complete.

B. Applicable portions of the SIS are drained.

14.2.12.1.57.3 Test Method. Disassemble the specified check valves in the SIS and very the proper seat-to-disc contact for each valve.

14.2.12.1.57.4 Acceptance Criteria. The check valves inspected have 100% seat-to-disc contact.

14.2.12.1.58 Containment Spray System Nozzle Air Test 2

14.2.12.1.58.1 Objective. Demonstrate that the spray nozzles in the containment spray header are clear of obstructions.

14.2.12.1.58.2 Plant Conditions and Prerequisites. The compressed air system is available to pressurize the spray headers.

14.2.12.1.58.3 Test Method. Air flow is initiated through the containment spray headers, and unobstructed flow is verified through each nozzle.

14.2.12.1.58.4 Acceptance Criteria. All containment spray nozzles are clear and unobstructed, as evidenced by air passing through each nozzle.

14.2.12.1.59 Containment Spray System 2

14.2.12.1.59.1 Objective. Demonstrate the operation of system components, including their response to safety signals, and verify that the associated instrumentation and controls are functioning properly. System flow characteristics in the test and simulated accident modes are also verified.

14.2.12.1.59.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests, instrument calibration, and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The refueling water storage tank contains an adequate supply of demineralized water for the performance of this test.

14.2.12.1.59.3 Test Method

A. Performance characteristics of the containment spray pumps are verified in the test mode, recirculating to the refueling water storage tank.

B. System component control circuits are verified, including the operation of system pumps and valves on receipt of safety signals.

C. During system operation, the spray additive eductor operations are verified.

14.2.12.1.59.4 Acceptance Criteria

A. Containment spray pump performance characteristics are within design specifications.

B. Containment spray pump and valve response to safety signals is verified, and the associated response times are within design specifications.

C. Spray additive eductor operates within design specifications.

2 14.2.12.1.60 Reactor Makeup Water System

14.2.12.1.60.1 Objectives

A. To demonstrate the operating characteristics of the reactor makeup water transfer pumps and verify that the associated control circuits function properly.

B. To demonstrate the operation of the system automatic valves.

C. To demonstrate the operation of the vacuum degasifier and associated control circuits, including the condensate storage and reactor makeup water storage tanks controls.

14.2.12.1.60.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The demineralized water storage and transfer system is available to provide a source of water to the reactor makeup water storage tank and to the condensate storage tanks via the vacuum degasifier.

14.2.12.1.60.3 Test Method

A. The reactor makeup water transfer pumps are operated, and pump operating data are recorded.

B. Reactor makeup water transfer pumps and system automatic valve control logics are verified.

C. Operate vacuum degasifier and verify operation and acceptable water quality. Verify the condensate storage tanks and the reactor makeup water storage tank level controls function.

14.2.12.1.60.4 Acceptance Criteria

A. The operating characteristics of the reactor makeup water transfer pumps are within design specifications.

B. Each reactor makeup water transfer pump trips on receipt of a reactor makeup water storage tank low-level signal.

C. Each reactor makeup water transfer pump starts, after a time delay, with the other pump running on the receipt of a low header pressure signal.

D. Vacuum degasifier operates within design specifications and all control circuits are operational.

14.2.12.1.61 Steam Generator Blowdown System |2

14.2.12.1.61.1 Objective. Demonstrate the ability of the steam generator blowdown system, in conjunction with the chemical control system, to maintain steam generator water chemistry within the prescribed limits.

14.2.12.1.61.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The turbine plant closed cooling water system is available.

D. The condensate system is available.

E. The circulating water system is available.

F. Hot functional testing shall be in progress.

14.2.12.1.61.3 Test Method. Initiate an AFS signal and observe operation of affected valves. Cycle all control valves and observe proper operation. Demonstrate proper operation of steam generator blowdown mixed demineralizer SGB flashtank, regenerative and non-regenerative SGB heat exchangers. Demonstrate the ability to process water to the condenser as well as the circulating water discharge conduit.

14.2.12.1.61.4 Acceptance Criteria

A. Control regulators maintain water chemistry as per design specifications.

B. Steam generator blowdown system operate as per design specifications.

2| 14.2.12.1.62 Main Turbine Steam Seals System

14.2.12.1.62.1 Objective. Demonstrate proper operation of the main turbine steam seal system.

14.2.12.1.62.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The main steam system is available to supply steam.

D. The auxiliary steam system is available.

E. The main turbine is on the turning gear.

14.2.12.1.62.3 Test Method. Operate steam seal system, observing vacuum, turbine seals, and associated instrumentation.

14.2.12.1.62.4 Acceptance Criteria. Main turbine steam seal system operates as designed.

14.2.12.1.63 Main Turbine and Generator Lube Oil System 2

14.2.12.1.63.1 Objective. Demonstrate the ability of the turbine lube oil system to provide adequate supply of lube oil to turbine and generator bearings. Verify operation of pressure controls and emergency backup oil sources; also verify lube oil temperature control.

14.2.12.1.63.2 Plant Conditions and Prerequisites

A. All construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The turbine plant closed cooling water system is available.

D. Main lube oil reservoir level is adequate to support this test.

14.2.12.1.63.3 Test Method. Operate the lube oil system in normal operating fashion. Verify and record lube oil system parameters. Test auto-start circuits on all backup and emergency oil pumps. Verify vapor extractor maintains negative press on lube oil reservoir. Verify operation of the loop seal oil tank vapor extractor.

14.2.12.1.63.4 Acceptance Criteria. The lube oil system operates per design specification, including lube oil temperature control and vapor extractors. The lube oil pumps meet design specification of flow capacities and pressures while operating.

14.2.12.1.64 Generator Hydrogen and Carbon Dioxide System

2

14.2.12.1.64.1 Objective. Demonstrate proper operation of the hydrogen supply, carbon dioxide supply, and gas control cubicle.

14.2.12.1.64.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The service gas system is available to supply gas.

D. The generator hydrogen seal oil system is available for operation.

14.2.12.1.64.3 Test Method. Place a hydrogen blanket on the generator; then place a carbon dioxide blanket and purge the generator with air. Verify system response, record data, and take samples of each gas blanket for quality.

14.2.12.1.64.4 Acceptance Criteria. The main generator can be charged with carbon dioxide or hydrogen properly to within design specifications.

2 14.2.12.1.65 Generator Hydrogen Seal Oil System

14.2.12.1.65.1 Objective. Demonstrate proper operation of vapor extractor, system pump, and regulating valves.

14.2.12.1.65.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The turbine plant closed cooling water system is available to supply cooling water.

14.2.12.1.65.3 Test Method. Operate the seal oil system and verify the performance of system pumps, vapor extractor, and regulating valves and check system interlocks.

14.2.12.1.65.4 Acceptance Criteria. Generator hydrogen seal oil system and backup air side seal oil perform as per design specifications.

14.2.12.1.66 Generator Stator Cooling System 2

14.2.12.1.66.1 Objectives

A. To demonstrate the operation and capacities of stator cooling water pumps.

B. Verify stator cooling water system components and control system operation.

C. Verify operation of unloading circuits and trips.

14.2.12.1.66.2 Plant Conditions and Prerequisites.

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The demineralized water system is available to support this test.

14.2.12.1.66.3 Test Method

A. Operate the stator cooling water system as designed. Verify cooling water pressures and record. Simulate a stator water cooling system high temperature condition and verify the turbine runback and trip signals are generated.

B. Verify water level control and water purity.

14.2.12.1.66.4 Acceptance Criteria

A. Stator cooling water pumps operate within design specifications.

B. Water treatment and level controls operate as per design specifications.

C. All temperature control and stator cooling water pumps operate within design specifications.

2 14.2.12.1.67 Lube Oil Storage, Transfer and Purification System

14.2.12.1.67.1 Objectives

A. To demonstrate the ability of the lube oil storage and transfer system to supply oil to, and pump oil from, the main turbine lube oil reservoir, lube oil conditioner steam generator feed pumps reservoirs, and lube oil conditioner.

B. To demonstrate the ability of the purification system to purify dirty lube oil.

C. To demonstrate the ability of the clean lube oil tank system operation.

14.2.12.1.67.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. Main turbine lube oil reservoirs and steam generator feed pump lube oil reservoir are available to receive oil.

D. Main turbine lube oil conditioner and steam generator feed pump lube oil conditioner are available to receive oil.

14.2.12.1.67.3 Test Method. Operate the transfer pumps and observe oil flow to each lube oil reservoir. Demonstrate the ability of dirty lube oil transfer pumps to transfer oil from related reservoirs to the dirty oil storage tank and the clean oil transfer pump to transfer oil to the related reservoirs. Operate the temporary lube oil centrifuge as per design specifications.

14.2.12.1.67.4 Acceptance Criteria. The lube oil storage, transfer and purification system operates as per design specifications.

14.2.12.1.68 Condenser Air Removal System 2

14.2.12.1.68.1 Objective. Demonstrate the operability of the condenser air removal system vacuum pumps, air ejectors, control valves, and their associated control circuits.

14.2.12.1.68.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The condensate storage tank is available to provide a source of water to the vacuum pump seal water reservoirs.

D. The turbine open cooling water system is available to provide cooling water to the mechanical vacuum pump seal water coolers.

E. Main steam is available to supply the air ejectors.

F. Condensate system is available to supply cooling water to the inter and after condensers for the air ejectors.

14.2.12.1.68.3 Test Method

A. The ability of the mechanical vacuum pumps to reduce condenser pressure during startup operation is verified.

B. Operability of the mechanical vacuum pumps, and their associated valves' control circuits is verified, including their response to a low condenser vacuum signal.

C. The operability of the air ejectors is verified.

14.2.12.1.68.4 Acceptance Criteria

A. The rate at which the mechanical vacuum pumps reduce condenser pressure is within design specifications.

B. The mechanical vacuum pumps start automatically on receipt of a low condenser vacuum signal.

C. The condenser air removal system valves operate per design specification.

D. The air ejectors operate per design specification.

2 14.2.12.1.69 Main Turbine Control Oil System

14.2.12.1.69.1 Objectives. Demonstrate the ability of the hydraulic oil system to supply oil at rated pressure and volume to operate various system components, and to demonstrate the ability of the accumulators to close the turbine control valves and stop valves under loss of control oil conditions.

14.2.12.1.69.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control systems are operational.

C. The turbine plant closed cooling water system is available to support this test.

14.2.12.1.69.3 Test Method. Operate oil pumps and booster pump, and verify that operation is within design specifications.

14.2.12.1.69.4 Acceptance Criteria

A. Verify oil pump and booster pump pressures and capacities are within design specifications.

B. Verify that fluid conditioner, oil coolers, and accumulator fluid filters operate within design specifications.

C. Verify all automatic functions and control circuits.

14.2.12.1.70 Main Turbine Governor Control System 2

14.2.12.1.70.1 Objective. Demonstrate proper operation of the governor control system.

14.2.12.1.70.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are completed.

B. Required electrical power supplies and control circuits are available and operational.

14.2.12.1.70.3 Test Method. Operate governor control system, and verify response and accuracy to system demands.

14.2.12.1.70.4 Acceptance Criteria. The governor control system will respond and perform as per design specifications.

14.2.12.1.71 Main Feed Pump Turbine Lube Oil System 2

14.2.12.1.71.1 Objectives

A. To demonstrate the ability of the main feed pump lube oil system to supply lube oil to main feed pump bearings.

B. To demonstrate operation of main and emergency oil pump by remote and manual control.

C. To demonstrate operation of control systems.

14.2.12.1.71.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The turbine plant closed cooling water system is available to support this test.

14.2.12.1.71.3 Test Method. Operate oil pumps in each operating mode. Verify and record oil pressures. Operate vapor extractors and record reservoir pressures.

14.2.12.1.71.4 Acceptance Criteria

A. The main feed pump lube oil system operates per design specification.

B. Control systems function per design specifications.

2 14.2.12.1.72 Circulating Water System

14.2.12.1.72.1 Objectives

A. To demonstrate proper operation of motor-operated valve logic.

B. To demonstrate proper operation of circulating water pump logic.

C. To demonstrate proper operation of the circulating water system.

14.2.12.1.72.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The raw water system service water pumps are available to supply bearing lubrication to the circulating water pumps.

D. The turbine plant open cooling water system is available for cooling of the water box scavenging pumps.

E. Water is available from the condensate system and storage tank for tube sheet seal water and water scavenging pump makeup seal water.

14.2.12.1.72.3 Test Method

A. Operate circulating water motor-operated valves from all points of control.

B. Operate circulating water pumps and record system parameters.

C. Operate system debris filter units.

14.2.12.1.72.4 Acceptance Criteria

A. Circulating water motor-operated valves operate as designed.

B. Circulating water pumps operate as designed.

C. Circulating water system performs its function as designed.

D. Debris filters operate per design specifications.

14.2.12.1.73 Amertap Condenser Tube Cleaning System 2

14.2.12.1.73.1 Objective. Demonstrate proper operation of the system.

14.2.12.1.73.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The circulating water system is available for operation.

14.2.12.1.73.3 Test Method. Operate the Amertap system in all modes.

14.2.12.1.73.4 Acceptance Criteria. The Amertap system functions as designed.

2 14.2.12.1.74 Circulating Water Screens and Water Pumps

14.2.12.1.74.1 Objective. Demonstrate the proper operation of the circulating water traveling screens and screen wash pumps.

14.2.12.1.74.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The circulating water forebay is flooded.

14.2.12.1.74.3 Test Method

A. Verify the control logic of each traveling screen and screen wash pump.

B. Verify the operation of each traveling screen and screen wash pump.

C. Verify the shear pin protective device is installed in each traveling screen.

14.2.12.1.74.4 Acceptance Criteria

A. Each traveling screen and screen wash pump operates per design specifications.

B. The traveling screens and screen wash pumps function as per system design.

2 14.2.12.1.75 Circulating Water Chemical Injection

14.2.12.1.75.1 Objective. Demonstrate the ability of the circulating water and nuclear service cooling water chemical control system to operate as per design criteria.

14.2.12.1.75.2 Plant Conditions and Prerequisites

A. Seawater supply is available to the sodium hypochlorite generator.

B. The circulating water system is available to receive chemical injection.

C. Required construction acceptance tests and system cleaning are complete.

D. Required electrical power supplies and control circuits are operational.

E. Instrument air and raw water supply systems are available to the circulating chemical injection system.

14.2.12.1.75.3 Test Method. Operate chemical injection system to demonstrate the generation of sodium hypochlorite and injection of chemicals into the circulating water system, and nuclear service cooling water system.

14.2.12.1.75.4 Acceptance Criteria

A. Chemical injection system generates sodium hypochlorite per design criteria.

B. Chemical injection system properly chlorinates the salt water cooling system.

14.2.12.1.76 Turbine Plant Open Cooling Water System 2

14.2.12.1.76.1 Objective. Demonstrate the ability of the turbine plant open cooling water pumps to operate per design specifications. Verify operation of pump and motor-operated valve logics and related control circuits.

14.2.12.1.76.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available.

C. The circulating water system discharge header is available to receive flow.

D. Nuclear service cooling water system discharge header is available to receive flow.

14.2.12.1.76.3 Test Method. Operate each turbine plant open cooling water pump and demonstrate valve logic. Use in-line flow elements to record system flow rates.

14.2.12.1.76.4 Acceptance Criteria

A. Verify that the turbine plant open cooling water pumps operate per design specifications.

B. Verify system flow rates to each component are per design specifications.

14.2.12.1.77 Turbine Plant Closed Cooling Water System

2

14.2.12.1.77.1 Objectives

A. To demonstrate the ability of turbine plant closed cooling water system to provide corrosion inhibited cooling water to each component heat exchanger.

B. To demonstrate the operating parameters of the turbine plant closed cooling water pumps.

C. To demonstrate that the associated controls and instrumentation are functioning properly.

14.2.12.1.77.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available.

C. The turbine plant open cooling water system is available to provide cooling water to the TPCCW heat exchangers.

14.2.12.1.77.3 Test Method. Operate the turbine plant closed cooling water pumps in as near to normal operating conditions as possible. Check for proper flow paths.

14.2.12.1.77.4 Acceptance Criteria

A. Each turbine plant closed cooling water pump logic operates per design specification.

B. Temperature control regulators modulate cooling water to the associate coolers.

C. Level controls on turbine plant closed cooling water surge tank function per design specification.

D. Water chemistry can be adjusted per design specification by injecting a corrosion inhibitor.

14.2.12.1.78 Fuel Pool Cooling and Cleanup | 2

14.2.12.1.78.1 Objectives. Demonstrate the operating characteristics of the spent fuel pool cooling pumps, fuel pool cleanup pump, and pool skimmers, and to verify that the associated instrumentation and controls are functioning properly.

14.2.12.1.78.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The component cooling water system is available to provide cooling water to the spent fuel pool cooling heat exchangers.

D. The liquid radwaste system is available to drain the refueling pool to the RWST.

E. The spent fuel pool and fuel transfer canals are filled to their normal operating levels.

14.2.12.1.78.3 Test Method

A. The spent fuel pool cooling pumps, fuel pool cleanup pump, and pool skimmers are operated in their various modes, and pump operating data is recorded.

B. System component control circuits are verified.

14.2.12.1.78.4 Acceptance Criteria

A. The operating characteristics of the spent fuel pool cooling pumps, fuel pool cleanup pump, and pool skimmers are within design specifications.

B. Each spent fuel pool cooling pump trips on a low spent fuel pool level signal.

C. Each spent fuel pool cooling pump trips on receipt of a load shed signal.

2| 14.2.12.1.79 Nuclear Service Cooling Water System

14.2.12.1.79.1 Objectives

A. To demonstrate the capability of the nuclear service cooling water system to provide cooling water during normal and emergency operating conditions.

B. To demonstrate the operating characteristics of the nuclear service cooling water pumps, and verify that the associated instrumentation function properly, including system response to safety signals.

14.2.12.1.79.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The circulating water system discharge header is available to receive cooling water effluent.

14.2.12.1.79.3 Test Method. The system will be operated in normal and emergency modes to demonstrate proper operation. Safety signals are initiated and response of system pumps is observed.

14.2.12.1.79.4 Acceptance Criteria

A. The operating system logic of each nuclear service cooling water pump is per design specifications.

B. System valves operate per design specifications.

C. Nuclear service cooling water pumps and valves respond to emergency actuation signals per design specification.

14.2.12.1.80 NSCW Screens and Pumps | 2

14.2.12.1.80.1 Objective. Demonstrate the proper operation of the nuclear service water traveling screens and screen wash pumps.

14.2.12.1.80.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The nuclear service water forebay is flooded.

14.2.12.1.80.3 Test Method

A. Verify the control logic of each traveling screen and screen wash pump.

B. Verify the operation of each traveling screen and screen wash pump.

C. Verify the shear pin protective device is installed in each traveling screen.

14.2.12.1.80.4 Acceptance Criteria

A. Each traveling screen and screen wash pump operates within design specifications.

B. The traveling screens and screen wash pumps function per system design.

14.2.12.1.81 Component Cooling Water System | 2

14.2.12.1.81.1 Objectives

A. To demonstrate the capability of the component cooling water system to provide cooling water during the normal, shutdown, and post-LOCA modes of operation.

B. To demonstrate the operating characteristics of the component cooling water pumps, and verify that the associated instrumentation and controls are functioning properly, including system response to safety signals.

14.2.12.1.81.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The nuclear service cooling water system is available to supply cooling water to the CCW heat exchangers.

14.2.12.1.81.3 Test Method

A. System operating characteristics are verified in the normal, shutdown, and post-LOCA modes of operation.

B. Safety signals are simulated and the response of system pumps and valves is verified.

14.2.12.1.81.4 Acceptance Criteria

A. The performance characteristics of each component cooling water pump are within design specifications.

B. Components supplied by the component cooling water system receive flows that are within design specifications with the system operating in the normal, shutdown, and post-LOCA modes.

C. Component cooling water pump and valve responses to load sequence, containment isolation, and safety injection signals are within design specifications.

2 14.2.12.1.82 Auxiliary Steam Generator and Auxiliary Steam System

14.2.12.1.82.1 Objectives. Demonstrate proper operation of the auxiliary steam generator, auxiliary steam system, and associated instrumentation.

14.2.12.1.82.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The auxiliary fuel oil storage and transfer system is available.

D. Compressed air is available.

14.2.12.1.82.3 Test Method. Auxiliary steam generator and system components are operated in the manual and automatic modes to demonstrate operation of the auxiliary steam generator.

14.2.12.1.82.4 Acceptance Criteria

A. The auxiliary steam generator and associated components operate per design specifications.

B. The chemical feed equipment operates per system design.

14.2.12.1.83 Central Chilled Water System

14.2.12.1.83.1 Objectives 2

A. To demonstrate proper operation of the central chilled water system and verify associated instrumentation and controls function properly.

B. To demonstrate each containment isolation valve responds to a safety signal.

2 14.2.12.1.83.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available.

C. The demineralized water system is available.

D. The service gas system is available.

E. The compressed air system is available.

F. The turbine plant open cooling water system is available.

2 14.2.12.1.83.3 Test Method. Central chilled water system components are operated in all modes and all lineups initiate safety signals to containment isolation valves and record data.

2 14.2.12.1.83.4 Acceptance Criteria

A. The chilled water system and components operate per system design.

B. Recorded closing times of containment isolation valves are within design specifications.

2 14.2.12.1.84 Nuclear Service Cooling Water Pump House HVAC

2 14.2.12.1.84.1 Objective. Demonstrate proper operation of the nuclear service cooling water pump house HVAC components and related control circuits.

14.2.12.1.84.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

14.2.12.1.84.3 Test Method. Operate each supply fan and heater in manual and automatic mode. 2

14.2.12.1.84.4 Acceptance Criteria. The supply fans and heaters operate per system design specifications. 2

14.2.12.1.85 Turbine Building HVAC 2

14.2.12.1.85.1 Objective. Demonstrate the operation of the turbine building HVAC system lube oil reservoir room exhaust fan, switchgear building supply and exhaust fan, and battery room exhaust fans; and to verify that the associated instrumentation and controls are functioning properly. 2

14.2.12.1.85.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. The turbine building HVAC system is balanced.

14.2.12.1.85.3 Test Method. Operate HVAC supply and exhaust fans and verify all heater operations. 2

14.2.12.1.85.4 Acceptance Criteria 2

A. Each fan unit can be operated from all points of control.

B. Heater units operate per design specifications.

14.2.12.1.86 Auxiliary Boiler and Water Treatment Building HVAC 2

14.2.12.1.86.1 Objective. Demonstrate proper operation of the auxiliary boiler and water treatment HVAC components and related control circuits. 2

2 14.2.12.1.86.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

2 14.2.12.1.86.3 Test Method. Operate each supply fan and heater in manual and automatic mode.

2 14.2.12.1.86.4 Acceptance Criteria. The supply fans and heaters operate per system design specifications.

2 14.2.12.1.87 Fire Water Pump House HVAC

2 14.2.12.1.87.1 Objective. Demonstrate proper operation of the fire water pump house HVAC components and related control circuits.

2 14.2.12.1.87.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

2 14.2.12.1.87.3 Test Method. Operate each supply fan and heater in manual and automatic mode.

2 14.2.12.1.87.4 Acceptance Criteria. The supply fans and heaters operate per system design specification.

14.2.12.1.88 Fuel Building HVAC System

2 14.2.12.1.88.1 Objectives

A. To demonstrate that the emergency exhaust fans are capable of maintaining a negative pressure in the fuel building or the auxiliary building during accident conditions with the buildings isolated.

B. To demonstrate the capacities of the fuel building supply unit fans, emergency exhaust fans, and the spent fuel pool pump room cooler fans.

C. The operability of system instrumentation and controls including the component response to safety signals is also verified.

14.2.12.1.88.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system air balancing are complete.

B. Required electrical power supplies and control circuits are operational.

C. The auxiliary building HVAC system has been air balanced and is available to support this test.

D. The central chilled water system is available to support this test.

14.2.12.1.88.3 Test Method 2

A. With the fuel building closed, the system is operated in its normal configuration, and the fuel building supply unit fan and spent fuel pool pump room cooler fan operation are verified.

B. With a fuel building emergency ventilation actuation system signal (FBEVAS) present, the emergency exhaust fan operation and negative fuel building pressures are verified.

C. With a safety injection signal (SIS) present and the auxiliary building isolated, the emergency exhaust fan operation and negative auxiliary building pressures are verified.

14.2.12.1.88.4 Acceptance Criteria 2

A. The auxiliary building and fuel building pressures maintained by the emergency exhaust fans are within design specifications.

B. The fuel building supply fans, emergency exhaust fans, and spent fuel pool pump room cooler fans operate within design specifications.

C. The fuel building ventilation system fans and dampers properly respond to FBEVAS and SIS, in accordance with system design.

2 14.2.12.1.89 Radwaste Building HVAC System

14.2.12.1.89.1 Objectives

A. To verify the radwaste building supply and exhaust fan control circuits, including automatic transfer between exhaust fans.

B. To demonstrate operation of the radwaste building supply and exhaust fans, boron regeneration system, recycle evaporator feedpump AHU, liquid radwaste evaporator air handling unit, radwaste control room air handling unit, recycle holdup tank air handling unit, radwaste building smoke removal fan, electric eqiupment room AHU, radwaste building utility fan, BRS evaporator AHU, and LRS pump room AHU and verify that the associated instrumentation and controls function properly.

2 14.2.12.1.89.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system air balancing are complete.

B. Required electrical power supplies and control circuits are available and operational.

2 14.2.12.1.89.3 Test Method

A. The radwaste building air handling units and fan operation is verified.

B. Operability of the radwaste building supply and exhaust fan control circuits is verified.

2 14.2.12.1.89.4 Acceptance Criteria

A. The radwaste building air handling units and fans operate per design specifications.

B. The radwaste building supply air unit will not operate unless either radwaste exhaust fan is operating.

3 C. A low flow on the operating radwaste building exhaust fan will cause the standby fan to start.

14.2.12.1.90 Essential Chilled Water System 2

14.2.12.1.90.1 Objectives 2

A. To demonstrate the essential chilled water system functions as per design specification.

B. That the system responds to all safety signals and that related control circuits are verified.

14.2.12.1.90.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The nuclear service cooling water system is available to support this test.

D. The demineralizer water system is available to support this test.

14.2.12.1.90.3 Test Method. Operate the chilled water pumps per design specifications. Initiate all safety signals to chilled water pump, and check for proper flow characteristics. 2

14.2.12.1.90.4 Acceptance Criteria 2

A. The chilled water system operates per design specifications.

B. The chilled water system responds to all safety signals.

14.2.12.1.91 Control Building HVAC System 2

14.2.12.1.91.1 Objective. Demonstrate the operation of the control building air handling units, control room kitchen normal exhaust fan, control room toilet normal exhaust fan, control room emergency supply of recirculation AHU control room filtration fans, control room normal supply/recirculation AHU, battery room normal and emergency exhaust fans, chiller room normal exhaust fans, and emergency switchgear/battery room air handling units. The system instrumentation and controls, including the component response to safety and fire signals, are also verified. 2

2 14.2.12.1.91.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system air balancing are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The compressed air system is available to supply air to system air-operated dampers.

2 14.2.12.1.91.3 Test Method

A. The control building system fans are operated from all points of control.

B. Proper response of system components to control room ventilation isolation signals (CREVS), safety injection signals (SIS), and fire signals are verified.

2 14.2.12.1.91.4 Acceptance Criteria

A. The control building HVAC air handling unit and fan operation are within design specifications.

B. The control building HVAC system fans and dampers properly respond to CREVS, SIS, and fire signals, in accordance with system design.

2 14.2.12.1.92 Auxiliary Building HVAC System

14.2.12.1.92.1 Objective. Demonstrate the operation of the auxiliary building supply air handling units, smoke removal fans, MG exhaust and supply fans, electrical penetration room AHUs, switchgear room recirculaton AHU, ESF switchgear room AHUs, pipe penetration room AHUs, auxiliary building normal exhaust filtration AHUs, associated pump room AHUs corridor AHUs, radioactive trench exhaust fan, letdown heat exchanger AHU, valve compartment AHUs, main steam support structure supply fan and boron injection tank room AHUs. The system instrumentation and controls, including component response to safety and fire signals, are also verified.

2 14.2.12.1.92.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system air balancing are complete.

B. Required electrical power supplies and control circuits are operational.

C. The essential chilled water system is available to support this test.

D. The fuel building HVAC system has been air balanced and is available to support this test.

14.2.12.1.92.3 Test Method 2

A. With the auxiliary building and fuel building closed, the system is operated in its normal configuration, and the system fan operation is verified.

B. Proper responses of system components to safety injection and fire signals are verified.

14.2.12.1.92.4 Acceptance Criteria 2

A. The auxiliary building fan operation is per design specifications.

B. The auxiliary building fans and dampers properly respond to safety injection and fire signals in accordance with system design. 462

14.2.12.1.93 Diesel Generator Building HVAC 2

14.2.12.1.93.1 Objective. Demonstrate the operation of the diesel generator room supply and exhaust fans and to verify that the system instrumentation and controls function properly, including the response of fans and associated dampers to a diesel generator start signal and room temperature signals.

14.2.12.1.93.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The diesel generator building HVAC system is air balanced.

D. The respective diesel generator is not operating while the room is under test.

2| 14.2.12.1.93.3 Test Method. The response of the diesel generator room supply fans and exhaust dampers to a diesel generator start signal and to room temperature signals is verified.

2| 14.2.12.1.93.4 Acceptance Criteria

A. The operation of the diesel generator room supply dampers and exhaust fans and dampers are per design specifications.

B. The diesel generator room supply dampers exhaust dampers open on receipt of a diesel generator start signal.

C. The diesel generator room supply fans stop on a low room temperature signal.

D. Normal unit heaters operate as per design.

2| 14.2.12.1.94 Reactor Cavity and Support Cooling System

14.2.12.1.94.1 Objective. Demonstrate the operation of reactor cavity cooling units and tendon gallery exhaust fans, and verify that their associated instrumentation and controls function properly.

2| 14.2.12.1.94.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. The central chilled water component cooling water systems are available to support this test.

D. The containment vessel is closed.

E. The reactor cooling and support cooling fans have been air balanced.

2| 14.2.12.1.94.3 Test Method. Reactor cavity cooling units and tendon gallery fans are operated, flow data is recorded, and fan capacities are calculated.

14.2.12.1.94.4 Acceptance Criteria. Reactor cavity cooling units and tendon gallery supply and exhaust fans operate within design specifications. |2

14.2.12.1.95 Containment Fan Cooling System |2

14.2.12.1.95.1 Objective. Demonstrate the operation of the containment fan coolers, and verify that their associated instrumentation and controls function properly, including fan response to safety signals.

14.2.12.1.95.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. The central service water system is available to supply water to the containment coolers.

D. The containment cooling system has been air balanced.

E. The containment vessel is closed.

14.2.12.1.95.3 Test Method |2

A. Each containment fan cooler is operated from all points of control.

B. The response of the containment cooling fans to safety signals is verified.

14.2.12.1.95.4 Acceptance Criteria |2

A. The operation of the containment cooling fans is within design specifications.

B. The containment cooling fans properly respond to safety signals in accordance with system design.

14.2.12.1.96 CRDM Cooling Fans System |2

14.2.12.1.96.1 Objective. Demonstrate the operation of the CRDM cooling fans, and verify that their associated instrumentation and controls function properly. |2

2 14.2.12.1.96.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The CRDM and cavity cooling portions of the containment cooling system are air balanced.

2 14.2.12.1.96.3 Test Method. The CRDM cooling fans are operated and data is recorded.

2 14.2.12.1.96.4 Acceptance Criteria. The operation of the CRDM cooling fans is within design specifications.

2 14.2.12.1.97 Steam Generator Recirculation Fans

14.2.12.1.97.1 Objective. Demonstrate the capabilities of the steam generator and pressurizer compartment recirculation fans and verify that their associated instrumentation and controls function properly.

2 14.2.12.1.97.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. The containment vessel is closed.

D. The steam generator recirculation and pressurizer fans have been air balanced.

2 14.2.12.1.97.3 Test Method. Operate steam generator and pressurizer compartment recirculation fans to demonstrate all system logic.

2 14.2.12.1.97.4 Acceptance Criteria

A. Fans operate within design specifications.

B. Fan controls operate as designed.

14.2.12.1.98 Containment Structural Integrity Test (SIT) |2

14.2.12.1.98.1 Objective. Demonstrate the structural integrity of the reactor containment building. |2

14.2.12.1.98.2 Plant Conditions and Prerequisites |2

A. Containment penetrations are installed, and penetration leak tests are complete.

B. Containment penetrations, including equipment hatches and personnel airlocks, are closed.

14.2.12.1.98.3 Test Method. The containment is pressurized at 115 percent (69 psig) of the design pressure and deflection measurements, and concrete crack inspections are made to determine that the actual structural response is within the limits predicted by the design analyses. |2

14.2.12.1.98.4 Acceptance Criteria. The containment structural response is within the limits predicted by design analyses. |2

14.2.12.1.99 Containment Integrated Leak Rate Test (ILRT) |2

14.2.12.1.99.1 Objective. Demonstrate that the total leakage from the containment does not exceed the maximum allowable leakage rate at the calculated peak containment internal pressure. |2

14.2.12.1.99.2 Plant Conditions and Prerequisites |2

A. The containment penetration leakage rate tests (type B tests), containment isolation valve leakage tests (type C tests), and containment structural integrity test are complete.

B. Containment isolation valves are closed by normal actuation methods.

C. Containment penetrations, including equipment hatches and personnel airlocks, are closed.

D. Portions of fluid systems that are part of the containment boundary, that may be opened directly to the containment of outside atmosphere under post-accident conditions, are opened or vented to the appropriate atmosphere to place the containment in as close to post-accident conditions as possible.

2 14.2.12.1.99.3 Test Method

A. The integrated containment leak rate test (type A test) is conducted, using the absolute method, described in the American National Standard N274, Containment System Leakage Testing, requirements. Measurements of containment atmosphere dry-bulk temperature, dew-point, and pressure are taken to calculate the leakage rate. A standard statistical analysis of data is conducted, using a linear least squares fit regression analysis to calculate the leakage rate.

B. On completion of the leak rate test, a verification test is conducted to confirm the capability of the data acquisition and reduction system to satisfactorily determine the calculated integrated leakage rate. The verification test is accomplished by imposing a known leakage rate on the containment, or by pumping back a known quantity of air into the containment through a calibrated flow measurement device.

2 14.2.12.1.99.4 Acceptance Criteria. The containment integrated leakage does not exceed the maximum allowable leakage rate at a calculated peak containment internal pressure, as defined in 10 CFR 50, Appendix J.

2 14.2.12.1.100 Containment Air Purification System

2 14.2.12.1.100.1 Objectives

A. To demonstrate the operation of each high and low volume supply and exhaust fan.

B. To demonstrate proper response of system instrumentation and controls, including the response of system fans and dampers to safety signals.

C. To demonstrate each containment isolation valve response to safety signals.

14.2.12.1.100.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system air balancing are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The compressed air system is available.

D. The central chilled water system is avilable.

14.2.12.1.100.3 Test Method. System fans are operated and response of the fans and dampers to safety signals is verified. Safety signals to each containment isolation valve are initiated. 2

14.2.12.1.100.4 Acceptance Criteria 2

A. Containment air purification system fans operate within design specifications.

B. System fans and dampers properly respond to safety signals and damper closure times are within design specifications.

14.2.12.1.101 Containment Combustible Gas Control System

14.2.12.1.101.1 Objectives 2

A. To demonstrate that the hydrogen recombiner performance characteristics are within design specifications.

B. To determine the operation of system dampers and valves, including the response of hydrogen purge and hydrogen monitoring containment isolation valves to CIS.

C. To demonstrate the operability of the hydrogen analyzers and their ability to sample the containment atmosphere.

14.2.12.1.101.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

2 14.2.12.1.101.3 Test Method

A. Performance characteristics are recorded while the hydrogen recombiners are operating.

B. System valve and damper control circuits are verified, including the response of hydrogen purge and hydrogen monitoring containment isolation valves to a CIS.

C. The hydrogen analyzers are operated and performance data is recorded.

2 14.2.12.1.101.4 Acceptance Criteria

A. Hydrogen recombiner performance characteristics are within design specifications.

B. Hydrogen purge and hydrogen monitoring containment isolation valves close on receipt of a CIS. Valve closure times are within design specifications.

14.2.12.1.102 Access Control Building HVAC

2 14.2.12.1.102.1 Objective. Demonstrate operation of the access control building air handling unit, electrical and instrument repair room air handling unit, access control building and laundry room exhaust fans, fume hood exhaust fan, and related system instrumentation.

2 14.2.12.1.102.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. The central chilled water system is available to support this test.

2 14.2.12.1.102.3 Test Method. Operate the system in its normal configuration and verify system operation. Operate duct heaters and verify operation. Observe that operation of system controls is within design specifications.

2 14.2.12.1.102.4 Acceptance Criteria. The access control building HVAC system and related components and controls operate within design specifications.

14.2.12.1.103 Steam Generator Blowdown Heat Exchanger HVAC 2

14.2.12.1.103.1 <u>Objective</u>. Demonstrate proper operation of the steam generator blowdown heat exchanger HVAC components and related control circuits.

14.2.12.1.103.2 <u>Plant Conditions and Prerequisites</u> 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

14.2.12.1.103.3 <u>Test Method</u>. Operate each supply fan and heater in manual and automatic mode. 2

14.2.12.1.103.4 <u>Acceptance Criteria</u>. The supply fans and heaters operate per system design specifications. 2

14.2.12.1.104 Chlorination Building HVAC 2

14.2.12.1.104.1 <u>Objective</u>. Demonstrate proper operation of the chlorination building HVAC components and related control circuits. 2

14.2.12.1.104.2 <u>Plant Conditions and Prerequisites</u> 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

14.2.12.1.104.3 <u>Test Method</u>. Operate each supply fan and heater in manual and automatic mode. 2

14.2.12.1.104.4 <u>Acceptance Criteria</u>. The supply fans and heaters operate per system design specification. 2

14.2.12.1.105 Gaseous Radwaste System 2

14.2.12.1.105.1 <u>Objective</u>. Demonstrate operation of the sample pump and compressors, and operability of system valves. Verify that system instrumentation and controls function properly. 2

2| 14.2.12.1.105.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The nitrogen service gas system is available.

2| 14.2.12.1.105.3 Test Method

A. Operation of the sample pump and compressors are verified.

B. System component control circuits are verified by system.

2| 14.2.12.1.105.4 Acceptance Criteria

A. Operation of the sample pump and compressors is within design specifications.

B. Valve operation and system instrumentation and control circuit response is within design specification.

2| 14.2.12.1.106 Liquid Radwaste System

2| 14.2.12.1.106.1 Objectives

A. To demonstrate operation of the liquid radwaste system pumps and to verify the operation of their associated control circuits.

B. To demonstrate operation of the liquid radwaste system valves.

2| 14.2.12.1.106.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.106.3 Test Method |2

A. The liquid radwaste system pumps are operated, and their performance is recorded.

B. The operability of the system pump and valve control circuits is verified.

14.2.12.1.106.4 Acceptance Criteria |2

A. The performance characteristics of the liquid radwaste system pumps are within design specifications.

B. Each pump trips on receipt of a low-level signal from its respective tank.

14.2.12.1.107 Waste Evaporator System |2

14.2.12.1.107.1 Objective. Demonstrate the operability of the waste evaporator and its associated pumps and control circuits. |2

14.2.12.1.107.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The component cooling water system is available to supply water to the waste evaporator.

D. The auxiliary steam system is available to supply steam to the waste evaporator.

E. The nitrogen service gas and demineralized water systems are available to the waste evaporator.

F. The LRS absorption and demineralizer vessels, low TDS holdup tank, auxiliary steam condensate recovery tank, and high TDS holdup tank are available to receive waste evaporator effluent.

14.2.12.1.107.3 Test Method. The waste evaporator is operated and performance data is recorded. With the waste evaporator in operation, a low feed inlet pressure signal is initiated, and the evaporator is verified to shift to the recycle mode. The waste evaporator distillate pump is verified to trip on a low evaporator condenser level. |2

2| 14.2.12.1.107.4 Acceptance Criteria

A. The waste evaporator process flow is within design specifications.

B. The waste evaporator goes into the recycle mode on low feed inlet pressure.

C. The waste evaporator distillate pump trips on a low evaporator condenser level.

2| 14.2.12.1.108 Radwaste Solidification System

2| 14.2.12.1.108.1 Objective. Demonstrate operation of the radwaste solidification system and pumps and to verify operation of their associated control circuits.

2| 14.2.12.1.108.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operable.

C. Radwaste building auxiliary building spent resin systems are available to support this test.

2| 14.2.12.1.108.3 Test Method. The radwaste solidification system pumps are operated and system component control circuits are verified. The ability of the radwaste solidification system to process, solidify, and handle waste is verified.

2| 14.2.12.1.108.4 Acceptance Criteria

A. Operation of the radwaste solidification system pumps is within design specifications.

B. There are no free liquids present in the packaged waste.

2| 14.2.12.1.109 Resin Transfer System

14.2.12.1.109.1 Objectives | 2

A. To demonstrate the ability to charge resins to those systems containing potentially contaminated demineralizers or absorbers. The ability of the spent resin sluice pumps to transfer resins from each of the demineralizers and absorbers is also verified.

B. To demonstrate the operating characteristics of the spent resin sluice pumps.

C. To demonstrate the operability of system valve and pump control circuits.

14.2.12.1.109.2 Plant Conditions and Prerequisites | 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational. | 1

C. Those systems containing potentially contaminated demineralizers and absorbers are available to support this test.

D. The reactor makeup water system is available to provide a source of water for resin charging.

E. A means of bulk disposal is available to receive waste at the bulk disposal station.

14.2.12.1.109.3 Test Method | 2

A. Resins are charged and transferred from each of the potentially contaminated demineralizers and absorbers.

B. The spent resin sluice pumps are operated, and performance characteristics are obtained.

C. Response of the spent resin sluice pumps to a low-level trip signal from their tanks is verified.

14.2.12.1.109.4 Acceptance Criteria | 2

A. Operating characteristics of the spent resin sluice pumps are within design specifications.

B. The spent resin sluice pumps trip on receipt of a low- level trip signal from their tanks.

2 14.2.12.1.110 Boron Recycle System

2 14.2.12.1.110.1 Objectives

A. Demonstrate the proper operation of the recycle evaporator feed demineralizers and filter.

B. Demonstrate proper operation of the recycle evaporator feed pump.

C. Demonstrate proper operation of the recycle evaporator package.

D. Demonstrate proper operation of the boron recycle system instrumentation, controls and alarms.

2 14.2.12.1.110.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. The component cooling water and demineralized water systems are available to supply water to the recycle evaporator.

D. The auxiliary steam system is available to supply steam to the recycle evaporator.

2 14.2.12.1.110.3 Test Method

A. The operability of the recycle evaporator feed demineralizers and filter is verified.

B. The operability of the recycle evaporator feed pumps is verified.

C. The operability of the recycle evaporator is verified.

2 14.2.12.1.110.4 Acceptance Criteria. The boron recycle system operates in accordance with its design criteria.

14.2.12.1.111 Auxiliary Building Radioactive Drains 2

14.2.12.1.111.1 Objectives

A. To demonstrate the ability of containment spray pump vault sump pumps and auxiliary building sump pumps operation and verify that their associated control circuits function properly.

B. To demonstrate operation of equipment drain tank pumps and verify that their associated control circuits function properly.

14.2.12.1.111.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. An outside source of water to affected sumps and equipment drain tanks is available.

14.2.12.1.111.3 Test Method. Operate sump pumps and equipment drain tank pumps, recording pump pressures. Verify each pump control circuit. 2

14.2.12.1.111.4 Acceptance Criteria 2

A. System pumps operate within system design specifications.

B. System automatic and local controls operate per design specifications.

14.2.12.1.112 Miscellaneous Building Radioactive Drains 2

14.2.12.1.112.1 Objective. Demonstrate proper operation of radioactive drain pumps and associated instrumentation and control circuitry for the fuel building normal and decontamination sumps and pumps, CCW buildings sumps and pumps, access control building sumps and pumps, and hotsink drain tank and pump.

2 14.2.12.1.112.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. A source of water is required when running pumps.

2 14.2.12.1.112.3 Test Method. Fill sumps by running water down various drain collectors or sumps and verify pump and instrumentation response to manual and automatic operation.

2 14.2.12.1.112.4 Acceptance Criteria. Fuel building normal and decontamination sumps and pumps, CCW building sump and pumps, access control building sumps and pumps, and the hotsink drain tank and pump and associated instrumentation respond in accordance with design specifications.

14.2.12.1.113 Containment Building Radioactive Drains

2 14.2.12.1.113.1 Objective. Demonstrate operation of the containment and reactor coolant drain tank sump pumps to reactor coolant drain tank pumps, and operability of related control functions and response to safety signals.

2 14.2.12.1.113.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. Support systems needed to perform this test are available.

2 14.2.12.1.113.3 Test Method

A. Operate affected sump pumps, verify operation of related control circuits, and record pressures.

B. Operate reactor coolant drain tank pump, verify operation of related control circuits, and record pressures.

C. Initiate CIS signal and verify operation of affected components.

14.2.12.1.113.4 Acceptance Criteria 2

A. Containment building sump pumps operate per system design specifications.

B. Reactor coolant drain tank pumps operate per system design specifications.

C. Safety signals per design specifications and valves operated within required times.

14.2.12.1.114 Radwaste Building Radioactive Drains 2

14.2.12.1.114.1 Objective. Demonstrate proper operation of radwaste tunnel sump and pumps, radwaste tunnel normal sump and pumps, and radwaste building normal and decontamination sump and pumps and associated instrumentation and control circuitry. 2

14.2.12.1.114.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. A source of water to allow operation of each drain pump is available.

14.2.12.1.114.3 Test Method. Fill sumps from various drainage points, and verify manual and automatic operation and system response. 2

14.2.12.1.114.4 Acceptance Criteria. Radwaste tunnel sump and pumps, radwaste tunnel normal sump and pumps, and radwaste building normal and decontamination sumps and pumps will respond properly to manual and automatic signals. 2

14.2.12.1.115 Radioactive Laundry System 2

14.2.12.1.115.1 Objective. Demonstrate operability of radioactive laundry system pumps and system components. 2

2 14.2.12.1.115.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

2 14.2.12.1.115.3 Test Method. Operate the radioactive laundry system drain tank pumps and verify response to automatic and manual control functions.

2 14.2.12.1.115.4 Acceptance Criteria. The radioactive laundry system and components operate in automatic and manual modes per system description.

2 14.2.12.1.116 Nuclear Sampling System

2 14.2.12.1.116.1 Objective. Demonstrate operability of nuclear sampling system and verify safety signal responses of system isolation valves. Flow rates to each sample vessel are also verified.

2 14.2.12.1.116.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. Component cooling water is available.

D. The demineralized water system is available.

E. Test is to be done during hot functional testing.

2 14.2.12.1.116.3 Test Method. Initiate safety signals to all related valves, verify response time, record flow rates, and observe proper sample cooler temperatures.

2 14.2.12.1.116.4 Acceptance Criteria. Containment isolation valves close within required times under flow and no-flow conditions. Observe that sample cooler operates per system design and record proper flow rates.

14.2.12.1.117 Auxiliary Fuel Oil Storage and Transfer 2

14.2.12.1.117.1 Objective. Demonstrate proper operation of the auxiliary fuel oil pumps, storage tank, and associated instrumentation.

14.2.12.1.117.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

14.2.12.1.117.3 Test Method. Operate each fuel oil pump to verify system logic, storage tank controls, and system response. 2

14.2.12.1.117.4 Acceptance Criteria 2

A. Pump logic is verified.

B. Storage tank and system instrumentation respond per design specifications.

14.2.12.1.118 Compressed Air System 2

14.2.12.1.118.1 Objectives 2

A. To demonstrate the ability of the air compressors to provide instrument and service air at proper pressures.

B. To demonstrate automatic control features of the air compressors and associate system control valves.

C. To demonstrate safety signal operation of associated containment isolation valves.

14.2.12.1.118.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power systems and control circuits are operational.

C. Trubine plant closed cooling water is available.

2| 14.2.12.1.118.3 Test Method. Operate the system air compressors in all operating configurations. Verify pressures and control system automatic starts and stops. Operate instrument air dryers and verify operation. Verify system valves for proper operation. Initiate safety signals to each containment isolation valve and record closing times. |462

2| 14.2.12.1.118.4 Acceptance Criteria

A. The air compressor and system components operate per design specifications.

B. Containment isolation valves close upon receipt of safety signal within specified times.

2| 14.2.12.1.119 Fire Protection System (Water)

2| 14.2.12.1.119.1 Objectives

A. To demonstrate operability of the preaction sprinkler system, wet-pipe sprinkler system, and the automatic water spray system, including system instrumentation, alarms, and interlocks.

B. To demonstrate operability of the system valves, including response to a safety signal from the motor and diesel-driven fire pump.

C. To verify spray to the applicable electrical system transformers.

2| 14.2.12.1.119.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. Water is available to the fire protection system headers.

2| 14.2.12.1.119.3 Test Method

A. Response of the preaction sprinkler system, wet-pipe sprinkler system, and automatic water spray system to fire detection signals is verified, including the operability of associated alarms, instrumentation, and interlocks.

B. The fire protection system containment isolation valves are operated under flow conditions and operating times are recorded, including response to a containment isolation signal.

C. Operate motor and diesel-driven pumps and obtain associated instrumentation response.

D. Spray to the applicable electrical transformers is verified.

14.2.12.1.119.4 Acceptance Criteria | 2

A. The preaction sprinkler system, wet-pipe sprinkler system, automatic water spray system and associated alarms, instrumentation, and interlocks operate in accordance with system design specifications.

B. The fire protection system containment isolation valves closure time is within design specifications.

C. The fire protection system containment isolation valves close on receipt of a CIS.

D. The spray to applicable electrical transformers is within design specifications.

E. Operability of the motor and diesel-driven pumps and associated instrumentation is within design specifications.

14.2.12.1.120 Seismic Fire Protection System | 2

14.2.12.1.120.1 Objective. Verify proper operation of the Seismic Category I fire protection pumps. Verify operation of motor-operated valves. | 2

14.2.12.1.120.2 Plant Conditions and Prerequisites | 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The condensate storage and transfer system is available to support this test.

2 14.2.12.1.120.3 Test Method. Manually start fire pumps and verify operation. Operate motor-operated valves and verify pump starting interlocks.

2 14.2.12.1.120.4 Acceptance Criteria

A. Fire pumps operate per system design specifications.

B. Motor-operated valves operate per design specifications and control circuits and interlocks are operational.

2 14.2.12.1.121 Domestic Water System

2 14.2.12.1.121.1 Objective. Demonstrate operation of the domestic water system and pumps.

2 14.2.12.1.121.2 Plant Conditions and Prerequisites

A. Required construction acceptance test and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. Kori Unit 1 domestic water treatment plant is in service.

2 14.2.12.1.121.3 Test Method. Operate each booster pump and access control building hot water recirculating pump to verify all logic. Operation of each backflow preventer is also verified.

2 14.2.12.1.121.4 Acceptance Criteria. Operation of the domestic water booster pump, access control building hot water recirculation pump, and backflow preventers are within design specifications.

2 14.2.12.1.122 Spent Fuel Pool Crane

2 14.2.12.1.122.1 Objectives

A. Demonstrate proper operation of the spent fuel pool bridge crane control circuits and associated interlocks.

B. Document the data obtained during testing of the spent fuel pool bridge crane at 125 percent of rated load.

14.2.12.1.122.2 Plant Conditions and Prerequisites |2

A. Required component testing and instrument calibration are completed.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.122.3 Test Method. Operability of the spent fuel pool bridge crane control circuits and associated interlocks is verified. |2

14.2.12.1.122.4 Acceptance Criteria |2

A. The spent fuel pool bridge crane electric and manual hoists support 125 percent of their rated load.

B. The spent fuel pool bridge crane monorail center span deflection at rated load is within design specifications.

C. The spent fuel pool crane bridge, trolley, and hoist speeds at rated loads are within design specifications.

14.2.12.1.123 New Fuel Elevator |2

14.2.12.1.123.1 Objectives. Demonstrate proper operation of the new fuel elevator control circuits and associated interlocks. |2

14.2.12.1.123.2 Plant Conditions and Prerequisites |2

A. Required component testing and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.123.3 Test Method. Operability of the new fuel elevator control circuits and associated interlocks is verified. |2

14.2.12.1.123.4 Acceptance Criteria. All control circuits and interlocks associated with the new fuel elevator operate in accordance with system design. |2

2 14.2.12.1.124 Fuel Handling and Storage

2 14.2.12.1.124.1 Objectives

A. Demonstrate the ability of the refueling machine, new fuel elevator, fuel transfer car, spent fuel bridge crane, spent fuel cask handling crane, and associated fuel handling tools to transfer a dummy fuel assembly.

B. Demonstrate proper operation of the spent fuel cask handling crane control circuits and associated interlocks.

C. Document the data obtained during testing of the spent fuel cask handling crane at 125 percent of rated load.

2 14.2.12.1.124.2 Plant Conditions and Prerequisites

A. Required component testing and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

C. The reactor vessel, refueling pool, refueling canal, and spent fuel pool are filled with demineralized water.

D. A dummy fuel assembly is available.

2 14.2.12.1.124.3 Test Method

A. During the transfer of a dummy fuel assembly, the operability of the refueling machine, new fuel elevator, fuel transfer car, spent fuel bridge crane, spent fuel cask handling crane, and associated fuel handling tools is verified.

B. Operability of the spent fuel cask handling crane control circuits and associated interlocks is verified.

2 14.2.12.1.124.4 Acceptance Criteria

A. While transferring a dummy fuel assembly, the refueling machine, new fuel elevator, fuel transfer car, spent fuel bridge crane, spent fuel cask handling crane, and associated fuel handling tools operate in accordance with system design.

B. All control circuits and interlocks associated with the spent fuel cask handling crane operate in accordance with system design.

C. The spent fuel cask handling crane hoist supports 125 percent of rated load.

D. The spent fuel cask handling crane bridge center span deflection at rated load is within design specifications.

E. The spent fuel cask handling crane bridge, trolley, and hoist speeds at rated loads are within design specifications.

14.2.12.1.125 Fuel Transfer System 2

14.2.12.1.125.1 Objectives. Demonstrate proper operation of the fuel transfer system control circuits and associated interlocks.

14.2.12.1.125.2 Plant Conditions and Prerequisites 2

A. Required component testing and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

14.2.12.1.125.3 Test Method. Operability of the fuel transfer system control circuits and associated interlocks is verified. 2

14.2.12.1.125.4 Acceptance Criteria. All control circuits and interlocks associated with the fuel transfer system operate in accordance with system design. 2

14.2.12.1.126 Refueling Machine and RCC Change Fixture

14.2.12.1.126.1 Objectives 2

A. To demonstrate proper operation of the refueling machine, rod cluster control change fixture, and containment building polar crane control circuits and associated interlocks.

B. To document the data obtained during testing of the containment building polar crane at 125 percent of rated load.

2 14.2.12.1.126.2 Plant Conditions and Prerequisites

A. Required component testing and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

2 14.2.12.1.126.3 Test Method

A. Operability of the refueling machine and rod cluster control change fixture control circuits and associated bridge, trolley, hoist, and gripper interlocks is verified.

B. Operability of the containment building polar crane control circuits and associated interlocks is verified.

2 14.2.12.1.126.4 Acceptance Criteria

A. All control circuits and interlocks associated with the refueling machine, rod cluster control change fixture, and containment building polar crane operate in accordance with system design.

B. The control circuits and interlocks associated with the containment building polar crane operate in accordance with system design.

C. The containment polar crane main and auxiliary hoists support 125 percent of their rated load.

D. The containment polar crane bridge center span deflection at rated load is within design specifications.

E. The containment polar crane bridge, trolley, and hoist speeds at rated loads are within design specifications.

2 14.2.12.1.127 Refueling Machine Indexing Test

2 14.2.12.1.127.1 Objectives

A. To verify the indexing of the refueling machine and establish bridge rail reference points for future operations.

B. To demonstrate the ability to transfer the dummy fuel assembly to the reactor vessel.

14.2.12.1.127.2 Plant Conditions and Prerequisites |2

A. Required component testing and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

C. A dummy fuel assembly is available.

14.2.12.1.127.3 Test Method. While transferring a dummy fuel assembly with the refueling machine, the bridge rail is marked at key transfer points. |2

14.2.12.1.127.4 Acceptance Criteria. The refueling machine can load a dummy fuel assembly in each of the reactor vessel fuel loading locations. |2

14.2.12.1.128 Polar Crane |2

14.2.12.1.128.1 Objective. Demonstrate that the containment polar crane is capable of performing as designed. |2

14.2.12.1.128.2 Plant Conditions and Prerequisites |2

A. Construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. Test equipment and materials are available.

D. Handling adaptors and accessories are available.

E. Verify that the ASME load test at 125 percent of design load has been performed.

14.2.12.1.128.3 Test Method |2

A. Verify control logic operation.

B. Verify alarms, interlocks, and instrumentation.

C. Verify all travel limits.

D. Verify suitability of adaptors and accessories for reactor component handling.

2| 14.2.12.1.128.4 Acceptance Criteria. The containment polar crane performs as described in design specifications.

2| 14.2.12.1.129 Service Gas Systems

2| 14.2.12.1.129.1 Objective. Demonstrate proper system operation, including valve operations for the hydrogen, nitrogen, and carbon dioxide system.

2| 14.2.12.1.129.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

2| 14.2.12.1.129.3 Test Method. Operate system valves and verify that all system pressures can be maintained.

2| 14.2.12.1.129.4 Acceptance Criteria. The hydrogen, nitrogen, and carbon dioxide system and associated valves and instrumentation operate within design specifications.

2| 14.2.12.1.130 Diesel Generator Fuel Oil System

2| 14.2.12.1.130.1 Objective. Demonstrate the operability of the diesel fuel oil transfer pumps. Verify all system control functions.

2| 14.2.12.1.130.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. Fuel oil is available to support this test.

2| 14.2.12.1.130.3 Test Method. Operate the diesel fuel oil transfer pumps. Initiate all automatic system function signals and verify required responses.

14.2.12.1.130.4 Acceptance Criteria |2

A. Diesel fuel oil transfer pumps operate per system design specifications.

B. Control functions are operable per system design specifications.

14.2.12.1.131 Diesel Generator Mechanical |2

14.2.12.1.131.1 Objectives |2

A. To demonstrate performance characteristics of the diesel generators and associated auxiliaries, and verify that each diesel reaches rated speed within the required time.

B. To verify operability of control circuits associated with the diesel generator and diesel auxiliaries, including the control circuit response to safety signals.

C. To demonstrate the capability of each air storage tank to provide five diesel cranking cycles without being recharged.

14.2.12.1.131.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. The nuclear service cooling water system is available to provide cooling water to the diesel engine intercooler heat exchanger.

D. The diesel fuel oil transfer system is available to provide fuel oil to the diesel generators.

E. The fire protection system is available to support this test.

14.2.12.1.131.3 Test Method |2

A. The diesel generators are started, and the time required to reach rated speed is recorded.

B. With the diesel generators and associated auxiliaries operating, performance characteristics are verified.

C. The operability of all control circuits associated with the diesel generator and diesel auxiliaries, including the control circuit response to safety signals, is verified.

D. The ability of each air storage tank to provide five diesel cranking cycles, without being recharged, is verified.

2 14.2.12.1.131.4 Acceptance Criteria

A. The time required for each diesel generator to reach rated speed is within design specifications.

B. Performance characteristics of the diesel generators and associated auxiliaries are within design specifications.

C. Each diesel generator starts automatically on receipt of a safety injection signal or a bus undervoltage signal.

D. Each diesel generator trips automatically on receipt of each of the following signals:

1. Generator differential

2. Lube oil pressure low

3. Crankcase pressure high

4. Start failure

5. Engine overspeed

E. Each air storage tank is capable of providing five diesel cranking cycles, without being recharged.

2 14.2.12.1.132 Oily Waste System

2 14.2.12.1.132.1 Objective. Demonstrate operation of oily waste sumps, pumps, valves, and instrumentation in the turbine building, diesel building, and control building.

14.2.12.1.132.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. Water is available to fill sumps to allow pump operation.

14.2.12.1.132.3 Test Method. Operate each sump pump in manual and automatic modes. |2

14.2.12.1.132.4 Acceptance Criteria. The oily waste sumps, pumps, and valves in the turbine building, diesel building, and control building operate in manual and automatic as designed. |2

14.2.12.1.133 Non-Radioactive Gravity Collection Drains |2

14.2.12.1.133.1 Objective. Demonstrate proper operation of sump pits and pumps and associated instrumentation and control circuitry.

14.2.12.1.133.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are available and operational.

C. A source of water to allow operation of each pump is available.

14.2.12.1.133.3 Test Method. Fill the sumps from various points and verify manual and automatic operation and system response. |2

14.2.12.1.133.4 Acceptance Criteria. The sump pits and pumps will properly operate to automatic and manual signals. |2

2 14.2.12.1.134 Main and Auxiliary Transformer

2 14.2.12.1.134.1 Objective. Demonstrate the capability of the main and unit auxiliary transformers to supply electrical power to the 345kV switchyard and 13.8kV and 4160V buses. Operation of protection devices and functional operation of controls and interlocks is also verified.

2 14.2.12.1.134.2 Plant Conditions and Prerequisites

A. Meters, relays, and protective devices are calibrated and tested.

B. Required electrical power supplies and control circuits are operational.

C. Erection work on transformers and switchgear is complete.

D. The transformer oil system is available.

E. Isolated phase bus support systems are available.

F. Required construction acceptance tests are complete.

2 14.2.12.1.134.3 Test Method

A. Simulate signals to temperature controls and verify operation of transformer oil pumps and fans.

B. Simulate signals to verify annunciators for transformer protective devices.

2 14.2.12.1.134.4 Acceptance Criteria. Transformers provide reliable source of electrical power to 345 kV switchyard and 13.8 kV, 4160V buses in accordance with design requirements.

2 14.2.12.1.135 Generator Excitation and Voltage Regulation

14.2.12.1.135.1 Objectives

A. To demonstrate the ability of the excitation system to control output voltage of the main generator.

B. To demonstrate the stability of the automatic regulator.

14.2.12.1.135.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. Main turbine and generator are available for synchronized operation.

14.2.12.1.135.3 Test Method. Verify operation of the individual components of the main generator excitation control system and document data to satisfy the acceptance criteria. |2

14.2.12.1.135.4 Acceptance Criteria. Main generator excitation control system functions in accordance with design requirements. |2

14.2.12.1.136 Startup Transformer X01 |2

14.2.12.1.136.1 Objective. Demonstrate the capability of the 345 kV startup transformer to supply electrical power to the 13.8 kV, non-Class 1E 4160V and Class 1E 4160V buses. Operation of protection devices and functional operation of controls and interlocks is verified. |2

14.2.12.1.136.2 Plant Conditions and Prerequisites |2

A. Meters, relays, and protective devices are calibrated and tested.

B. Required electrical power supplies and control circuits are operational.

C. Erection work on transformers and switchgear is complete.

D. Transformer oil and gas systems are available.

E. Required construction acceptance tests are complete.

F. The 345V system has been energized.

G. Isolated phase bus is tested and ready for service.

14.2.12.1.136.3 Test Method |2

A. Simulate signals to temperature controls and verify operation of transformer oil pumps and fans.

B. Simulate signals to each transformer protective device to verify transformer protective logic.

2 14.2.12.1.136.4 Acceptance Criteria. Transformers provide a reliable source of electrical power to 13.8 kV and non-Class 1E 4160V and Class 1E 4160V buses in accordance with design requirements. System protective devices operate per design specifications.

2 14.2.12.1.137 Startup Transformer X02

2 14.2.12.1.137.1 Objective. Demonstrate the capability of the 345 kV startup transformer to supply electrical power to the 13.8 kV, non-Class 1E 4160V and Class 1E 4160V buses. Operation of protection devices and functional operation of controls and interlocks are verified.

2 14.2.12.1.137.2 Plant Conditions and Prerequisites

A. Meters, relays, and protective devices are calibrated and tested.

B. Required electrical power supplies and control circuits are operational.

C. Erection work on transformers and switchgear is complete.

D. Transformer oil and gas systems are available.

E. Isolated phase bus is tested and ready for service.

F. Required construction acceptance tests are complete.

G. The 345kV system has been energized.

2 14.2.12.1.137.3 Test Method

A. Simulate signals to temperature controls and verify operation of transformer oil pumps and fans.

B. Simulate signals to each transformer protective device to verify transformer protective logic.

2 14.2.12.1.137.4 Acceptance Criteria. Transformers provide a reliable source of electrical power to 13.8 kV and non-Class 1E

4160V and Class 1E 4160V buses in accordance with design requirements. System protective devices operate per design specifications.

14.2.12.1.138 13.8 kV System |2

14.2.12.1.138.1 Objectives |2

A. To demonstrate that the 13.8 kV buses can be energized from the respective startup transformer.

B. To demonstrate that automatic fast transfer and the delayed transfer of the buses from the unit auxiliary transformers to the startup transformers is within design specifications. Proper operation of system instrumentation and controls is verified.

14.2.12.1.138.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. The 13.8 kV system has been energized.

14.2.12.1.138.3 Test Method |2

A. The 13.8kV buses are energized from the respective startup transformer, and bus voltage and phase rotation are recorded.

B. Automatic fast transfer from the respective unit auxiliary transformer to the startup transformer is verified.

C. Delayed transfer from the respective unit auxiliary transformer to the startup transformer is verified.

D. Electrical fault signals are simulated, and proper operation of the 13.8 kV auxiliary and startup transformer breakers are verified.

14.2.12.1.138.4 Acceptance Criteria |2

A. The 13.8 kV bus voltage and phase rotation are within design specifications.

B. Automatic fast transfer from the unit auxiliary transformers to the startup transformers is within design specifications.

C. Delayed transfer from the unit auxiliary transformer to the startup transformers is within design specification.

D. The 13.8 kV auxiliary transformer and startup transformer breakers trip on receipt of an electrical fault signal.

2 14.2.12.1.139 4.16 kV (Non-Class 1E) System

2 14.2.12.1.139.1 Objectives

A. To demonstrate that the 4.16 kV (non-Class 1E) buses can be energized from the respective startup transformer.

B. To demonstrate that automatic fast transfer of the buses from the unit auxiliary transformer to the startup transformer is within design specifications. Proper operation of system instrumentation and controls is verified.

2 14.2.12.1.139.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. The 4.16 kV (non-Class 1E) system has been energized.

2 14.2.12.1.139.3 Test Method

A. The 4.16 kV (non-Class 1E) buses are energized from the startup transformer, and bus voltage and phase rotation is recorded.

B. Automatic fast transfer from the respective unit auxiliary transformer to the startup transformer is verified.

C. Electrical fault signals are simulated, and proper operation of the 4.16 kV auxiliary transformer and startup transformer breakers is verified.

14.2.12.1.139.4 Acceptance Criteria |2

A. The 4.16 kV (non-Class 1E) bus voltage and phase rotation are within design specifications.

B. Automatic fast transfer of the buses from the unit auxiliary transformer to the startup transformer is within design specifications.

C. The 4.16 kV (non-Class 1E) auxiliary transformer and startup transformer breakers trip on receipt of an electrical fault signal.

14.2.12.1.140 Non-Class 1E Diesel Generator |2

14.2.12.1.140.1 Objectives |2

A. To demonstrate the ability of the diesel generator to carry the design rated load within design specifications.

B. To demonstrate the ability of the diesel generator to attain and stabilize frequency and voltage within the rated limits and time.

C. To demonstrate that the diesel generator starts automatically and the diesel generator feeder breaker closes when an undervoltage signal is received from the bus.

D. To demonstrate the capability of the diesel generator to withstand a maximum rated load rejection without exceeding speeds or voltages that cause tripping or damage.

E. To demonstrate the operability of the diesel generator feeder breaker and associated interlocks.

14.2.12.1.140.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. Bus N-5E-NH-E29 is available for loading to support this test.

2 14.2.12.1.140.3 <u>Test Method</u>

A. The design rated load test is demonstrated.

B. The ability of the diesel generator to attain and stablize frequency and voltage within the rated limits and time is verified.

C. The ability of the diesel generator to start automatically and the feeder breaker to close when an undervoltage signal is received on the bus is verified.

D. The ability of diesel generator to withstand a maximum rate load rejection without exceeding speeds or voltages is verified.

E. The operability of the diesel generator feeder breaker and associated interlocks is verified.

2 14.2.12.1.140.4 <u>Acceptance Criteria</u>

A. The design rated load test is within system design specifications.

B. The diesel generator can attain and stabilize frequency and voltage within design specifications.

C. The diesel generator starts automatically and the feeder breaker closes on receipt of an undervoltage signal from the bus.

D. Diesel generator is capable of withstanding the maximum rated load rejection without exceeding frequency or voltage design limits.

E. Controls and interlocks associated with the diesel generator feeder breakers operate in accordance with system design.

2 14.2.12.1.141 480V (Non-Class 1E) System

2 14.2.12.1.141.1 <u>Objective</u>. Demonstrate the capability of the 480V (non-Class 1E) system to provide proper voltage and phasing to plant (non-Class 1E) motor control centers and auxiliaries.

2 14.2.12.1.141.2 <u>Plant Conditions and Prerequisites</u>

A. Required construction acceptance tests are complete.

B. Required electrical control circuits are operational.

C. The 4160V (non-Class 1E) system is energized and is in service.

14.2.12.1.141.3 Test Method 2

With each individual 480V (non-Class 1E) load center energized from the respective 4160V supply, load center transformers, normal and alternate feeder breakers, metering and relaying device operation and interlocks are demonstrated.

14.2.12.1.141.4 Acceptance Criteria 2

A. 480V (non-Class 1E) load center feeder breaker interlocks operate in accordance with the system design.

B. All indication, alarms, metering and protective relays function properly in accordance with the system design.

C. The voltage and phasing of each 480V (non-Class 1E) load center, when supplied from its normal source and alternate source, are within design specifications.

14.2.12.1.142 250V dc System 2

14.2.12.1.142.1 Objective. Demonstrate the ability of the battery and battery chargers, principal and backup, to provide power to the buses. The battery chargers ability to recharge its repective battery is demonstrated. Proper operation of system instrumentation and controls is verified. 2

14.2.12.1.142.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. Ventilation for the battery room is available.

D. The 250V dc system has been energized.

14.2.12.1.142.3 Test Method 2

A. The battery is discharged, using a test load, at the design duty cycle discharge rate.

B. The battery is fully discharged to determine its capacity factor.

C. The ability of each battery charger to charge the battery to normal conditions, after the battery has been fully discharged while simultaneously supplying power at a rate equivalent to the largest motor current load, is verified.

2 14.2.12.1.142.4 <u>Acceptance Criteria</u>

A. The battery is capable of maintaining output voltage above the design minimum during a design duty cycle.

B. The battery capacity factor is within design specifications.

C. The battery chargers are able to recharge the battery to normal conditions, after the battery has been fully discharged, while simultaneously supplying power at a rate equivalent to the total motor full load current.

2 14.2.12.1.143 125V (Non-Class 1E) dc System

2 14.2.12.1.143.1 <u>Objective</u>. Demonstrate the ability of the batteries and chargers, normal and backup, to provide power to the buses. The battery charger's ability to recharge its respective battery and proper operation of system instrumentation and controls is verified.

2 14.2.12.1.143.2 <u>Plant Conditions and Prerequisites</u>

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are operational.

C. Ventilation for the battery room is available.

2 14.2.12.1.143.3 <u>Test Method</u>. Each battery is discharged, using a test load at the design duty cycle discharge rate, and the battery capacity factor is determined. The ability of each battery charger to charge its respective battery to normal conditions, after the battery has undergone a design duty cycle while simultaneously supplying power at a rate equivalent to the design instrumentation loading, is verified.

2 14.2.12.1.143.4 <u>Acceptance Criteria</u>

A. Each battery is capable of maintaining output voltage above the design minimum during a design duty cycle.

B. Each battery capacity factor is within design specifications.

C. The battery chargers are able to recharge the batteries to normal conditions, after the battery has undergone a design duty cycle, while simultaneously supplying power at a rate equivalent to the design load.

14.2.12.1.144 Plant Computer Power Supply System 2

14.2.12.1.144.1 Objective. Demonstrate that the 120V plant computer power supply system can be fed from its normal and alternate sources. Proper operation of the power sources (inverters), protective devices, alarms and control. 2

14.2.12.1.144.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

14.2.12.1.144.3 Test Method. Computer power supply distribution panels are energized from the normal source and automatically transferred to backup source. Verify interlocks, indication, and relay devices of the feeder breakers. 2

14.2.12.1.144.4 Acceptance Criteria 2

A. Normal source power supply for plant computer voltage and frequency are within design specifications.

B. Alternate source power supply for plant computer voltage and frequency are within design specifications.

14.2.12.1.145 Instrument 120V ac (Non-Class 1E) System 2

14.2.12.1.145.1 Objective. Demonstrate that the 120V ac (non-Class 1E) distribution panels can be fed from their normal and backup sources. Proper operation of feeder breakers interlock, instrumentation and controls is verified.

14.2.12.1.145.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

2| 14.2.12.1.145.3 Test Method. Individual 120V ac (non-Class 1E) distribution panels are energized from their normal source and automatically transferred to backup source. Verify interlocks, indication, and relaying devices of the feeder breakers.

2| 14.2.12.1.145.4 Acceptance Criteria

A. Each 120V ac (non-Class 1E) distribution panel voltage and frequency, when supplied from its normal (AC and DC) source, are within design specifications.

B. Each 120V ac (non-Class 1E) distribution panel voltage, when supplied from the backup source, is within design specifications.

2| 14.2.12.1.146 4.16kV (Class 1E) System

2| 14.2.12.1.146.1 Objective. Demonstrate that the 4.16 kV (Class 1E) buses can be energized from their respective normal and alternate preferred power sources. Verify that the preferred power sources undervoltage condition trips the associated feeder breakers. Proper operation of system instrumentation and controls is verified.

2| 14.2.12.1.146.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. The 4.16 kV (Class 1E) system has been energized.

2| 14.2.12.1.146.3 Test Method. Individual 4.16 kV (Class 1E) buses are energized from their respective normal and alternate preferred power sources. Demonstrate the undervoltage conditions and verify proper operation of the normal and alternate feeder breakers.

14.2.12.1.146.4 Acceptance Criteria |2

A. The voltage and phasing of each 4.16 kV (Class 1E) bus, when supplied from its normal preferred power source, are within design specifications.

B. The voltage and phasing of each 4.16 kV (Class 1E) bus, when supplied from its alternate preferred power source, are within design specifications.

C. The 4.16 kV (Class 1E) normal and alternate feeder breakers trip and lock open on receipt of normal and alternate preferred power source undervoltage signals.

14.2.12.1.147 Diesel Generator Electrical |2

14.2.12.1.147.1 Objectives |2

A. To demonstrate the ability of each diesel generator to carry the continuous rated load, the short-time rated load, and design rated load within design specifications.

B. To demonstrate the ability of each diesel generator to attain and stabilize frequency and voltage within the rated limits and time.

C. To demonstrate that each diesel generator starts automatically on an engineered safety feature signal and/or 4.16 kV bus loss of voltage and that the associated diesel generator feeder breaker closes when on an undervoltage signal received from the respective 4.16 kV bus the diesel generator rated voltage and frequency has been attained.

D. To demonstrate the capability of each diesel generator to withstand a maximum rate load rejection without exceeding speeds or voltages that cause tripping or damage.

E. To demonstrate the operability of each diesel generator feeder breaker and associated interlocks.

14.2.12.1.147.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. Required mechanical systems associated with the diesel generators are available.

D. The respective 4.16 kV (Class 1E) buses are available for loading to support this test.

2 14.2.12.1.147.3 Test Method

A. The continuous rated load, short-time rated load, and design rated load tests are demonstrated.

B. The ability of each diesel generator to attain and stabilize frequency and voltage within the rated limits and time is verified.

C. The ability of each diesel generator to start automatically on an engineered safety feature signal and/or 4.16 kV bus loss of voltage is verified. The ability of the associated feeder breaker to close on an undervoltage signal received on the respective 4.16 kV bus is verified when the diesel generator rated voltage and frequency has been attained.

D. The ability of each diesel generator to withstand a maximum rated load rejection, without exceeding speeds or voltages, is verified.

E. The operability of each diesel generator feeder breaker and associated interlocks is verified.

2 14.2.12.1.147.4 Acceptance Criteria

A. The continuous rated load, short-time rated load, and design rated load tests are within system design specifications.

B. Each diesel generator can attain and stabilize frequency and voltage within specifications.

C. Each diesel generator starts automatically on an engineered safety feature signal and/or 4.16 kV bus loss of voltage and the associated feeder breaker closes on receipt of an undervoltage signal from the respective 4.16 kV bus when the diesel generator has attained its rated voltage and frequency.

D. Each diesel generator is capable of withstanding the maximum rated load rejection without exceeding frequency or voltage design limits.

E. The controls and interlocks associated with the diesel generator feeder breakers operate in accordance with system design.

14.2.12.1.148 Diesel Generator Load Sequencing 2

NOTE

Due to the size of this test, the load sequencing is not a part of the BOP ESFAS test (5P-A-SA-01) 2

14.2.12.1.148.1 Objective. Demonstrate that diesel generators are capable of providing the required power to equipment vital to safe reactor shutdown under emergency conditions. Proper load shedding and load sequencing is verified. 2

14.2.12.1.148.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. Required mechanical systems associated with the diesel generator systems are available.

D. Required Class 1E 4.16 kV systems, 480V load centers, and 480V motor control centers are available.

14.2.12.1.148.3 Test Method. Automatic diesel generator starting, load shedding, and load sequencing are demonstrated for a simulated engineered safety feature signal, a loss of preferred power signal, and combined engineered safety feature and loss of preferred power simulated signals. 2

14.2.12.1.148.4 Acceptance Criteria 2

A. Automatic starting, loading shedding, and load sequencing of each diesel generator are accomplished per system design specifications.

B. Controls, interlocks, indications, and alarms function in accordance with system design.

14.2.12.1.149 Diesel Generator Load Group Assignments

2 14.2.12.1.149.1 Objective. Demonstrate the ability of the emergency diesel generators to provide reliable emergency power and verify the independence of emergency redundant onsite power sources and their load groups.

2 14.2.12.1.149.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. Required mechanical systems associated with the diesel generator systems are available.

D. Required Class 1E 4.16 kV systems, 480V load centers, and 480V motor control centers are available.

2 14.2.12.1.149.3 Test Method. Each 4.16 kV (Class 1E) bus is energized from its respective diesel generator by simulated engineered safety features actuation system (ESFAS) signals and loss of offsite power sources. The independence of emergency onsite redundant power sources and load groups is verified.

2 14.2.12.1.149.4 Acceptance Criteria

A. Each emergency redundant onsite power source and its load group function as designed without dependence upon any other redundant load group or portion thereof.

B. Dc and onsite ac buses and related loads not under test verify the absence of voltage from the respective load group.

2 14.2.12.1.150 480V (Class 1E) System

2 14.2.12.1.150.1 Objective. Demonstrate the capability of the 480V (Class 1E) system to provide proper voltage and phasing to plant (Class 1E) motor control centers and auxiliaries.

14.2.12.1.150.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical control circuits are available.

C. 4160V (Class 1E) systems are in service.

14.2.12.1.150.3 Test Method. Energize each individual 480V (Class 1E) load center from its respective 4160V power supply. Demonstrate the operation of load center transformer, feeder breakers, metering and relaying devices. |2

14.2.12.1.150.4 Acceptance Criteria |2

A. 480V (Class 1E) load center breaker interlocks operate in accordance with the system design.

B. Indication, alarms, metering and protective relays function properly in accordance with system design.

C. The voltage and phasing of each 480V (Class 1E) load center, when energized, is within design specifications.

14.2.12.1.151 125V (Class 1E) dc System |2

14.2.12.1.151.1 Objective. Demonstrate the ability of the batteries and chargers to provide power during normal and abnormal conditions. The battery charger's ability to recharge its respective battery is demonstrated. Proper operation of the system instrumentation and controls is verified. |2

14.2.12.1.151.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

C. Ventilation for the respective battery rooms is available.

14.2.12.1.151.3 Test Method. Each battery is discharged. Using a test load at the design duty cycle discharge rate, discharge each battery and determine its capacity factor. Verify that each battery charger will charge its respective |2 batteries to normal conditions, after the batteries have undergone a design duty cycle, while simultaneously supplying power at a rate equivalent to the design emergency loading.

2 14.2.12.1.151.4 Acceptance Criteria

A. Each battery is capable of maintaining output voltage above the design minimum during a design duty cycle.

B. Each battery capacity factor is in accordance with design specifications.

C. The battery chargers are able to recharge the batteries to normal conditions, after the batteries have undergone a design duty cycle, while simultaneously supplying power at a rate equivalent to the design emergency loading.

14.2.12.1.152 Instrument 120V ac (Class 1E) System

2 14.2.12.1.153.1 Objective. Demonstrate that the 120V ac (Class 1E) distribution panels can be supplied from their normal source inverters and from their backup source regulated transformers by manual transfer. The operability of system instrumentation and controls, including breaker protective interlocks, is verified.

2 14.2.12.1.152.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

2 14.2.12.1.152.3 Test Method

A. The 120V ac (Class 1E) distribution panels are energized from their normal source inverters and distribution panel voltages are recorded.

B. The 120V ac (Class 1E) distribution panels are energized from their backup source regulated transformers by manual transfer and distribution panel voltages are recorded.

C. The system breakers are operated and breaker interlocks are verified.

14.2.12.1.152.4 Acceptance Criteria |2

A. Each 120V ac (Class 1E) distribution panel voltage and frequency, when supplied from the normal source inverters of the distribution panel, is within design specifications.

B. Each 120V ac (Class 1E) distribution panel voltage, when supplied from the backup source regulated transformers, is within design specifications.

C. System breaker interlocks operate in accordance with system design.

14.2.12.1.153 Emergency Lighting System |2

14.2.12.1.153.1 Objective. Demonstrate the transfer capability from ac power source to dc power source of each power pack of the emergency lighting, and the adequacy of the lighting provided. |2

14.2.12.1.153.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. The normal, essential, and emergency lighting systems have been energized.

14.2.12.1.153.3 Test Method |2

A. Demonstrate that loss of ac power source to the emergency lighting system results in transfer of each power pack unit to dc power source.

B. Verify that acceptable lighting levels are provided when all other ac lighting systems are turned off.

14.2.12.1.153.4 Acceptance Criteria. The emergency lighting system is capable of supplying adequate lighting levels in the event of loss of normal and essential lighting ac power, and operated in accordance with system design specifications. |2

14.2.12.1.154 Public Address System |2

14.2.12.1.154.1 Objective. Demonstrate the capability of the public address system to provide adequate intraplant communications and to verify the operability of the evacuation alarm system. |2

2| 14.2.12.1.154.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

2| 14.2.12.1.154.3 Test Method. The public address system is operated from all locations, and adequate communications are verified. The operability of the evacuation alarm system is also verified.

2| 14.2.12.1.154.4 Acceptance Criteria

A. The public address system operates in accordance with system design specifications.

B. The evacuation alarm system operates in accordance with system design specifications.

2| 14.2.12.1.155 Cathodic Protection System

2| 14.12.12.1.155.1 Objective. Demonstrate the reliability and performance of the corrosion protection system for metallic surfaces and reinforced concrete structures which are in contact with soil or underground.

2| 14.2.12.1.155.2 Plant Conditions and Prerequisites

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available.

2| 14.2.12.1.155.3 Test Method. Verify power supply rectifiers dc output can be varied for cathodic protection. Verify the installation of shunts to monitor the current output from each individual anode with the balancing resistor to attain safe anode output. Verify potential stations have test leads to perform pipe-to-earth potential measurements and over the pipeline potential measurements.

2| 14.2.12.1.155.4 Acceptance Criteria. The cathodic protection system operates in accordance with system design specifications.

14.2.12.1.156 Heat Tracing/Freeze Protection System |2

14.2.12.1.156.1 Objectives |2

A. Demonstrate the ability of the heat tracing/freeze protection system to automatically control the associated heat tracing circuits.

B. Verify proper annunciation of alarm conditions.

14.2.12.1.156.2 Plant Conditions and Prerequisites |2

A. Required component testing and instrument calibration is complete.

B. Required electrical power supplies and control circuits are in operation.

14.2.12.1.156.3 Test Method |2

A. Produce simulated variations of temperature signals, and verify the automatic on-off switching of heaters within the system.

B. Simulate alarm conditions and verify proper annunciation.

14.2.12.1.156.4 Acceptance Criteria |2

A. The heat tracing/freeze protection system automatically controls its associated heat tracing circuits to maintain temperatures in a specified range.

B. Alarm conditions are properly annunciated.

14.2.12.1.157 Fire Detection and Alarm System |2

14.2.12.1.157.1 Objective. Demonstrate the operability of the fire protection system detectors and alarms. |2

14.2.12.1.157.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

2| 14.2.12.1.157.3 Test Method. Actuation of system alarms upon receipt of fire detection signals is verified.

2| 14.2.12.1.157.4 Acceptance Criteria. Fire protection system detectors and alarms operate in accordance with system design specifications.

2| 14.2.12.1.158 Special Process Heat Tracing

2| 14.2.12.1.158.1 Objectives

A. Demonstrate the ability of the special process heat tracing system to automatically control the associated heat tracing circuits.

B. Demonstrate the ability to manually switch the special process heat tracing system from a primary source of electrical power to the standby source of electrical power.

C. Verify proper annunciation of alarm conditions.

2| 14.2.12.1.158.2 Plant Conditions and Prerequisites

A. Required component testing and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

2| 14.2.12.1.158.3 Test Method

A. Produce simulated variations of temperature signals, and verify the automatic on-off switching of heaters within the system.

B. Manually switch the source of electrical power for the special process heat tracing system from the primary to the standby source.

C. Simulate alarm conditions and verify proper annunciation.

2| 14.2.12.1.158.4 Acceptance Criteria

A. The special process heat tracing system automatically controls its associated heat tracing circuits to maintain temperatures in a specified range.

B. The special process heat tracing system can be manually switched as needed from its primary to its standby source of electrical power.

C. Alarm conditions are properly annunciated.

14.2.12.1.159 Non-Radioactive Liquid Sampling System 2

14.2.12.1.159.1 Objectives

A. To demonstrate the operating characteristics of the steam generator blowdown sample system, feedwater and condensate sample system, and the turbine drains sample system, and to verify the operability of their associated control circuits.

B. To demonstrate that the system sample flows are within design specifications, and to verify the response to safety signals.

14.2.12.1.159.2 Plant Conditions and Prerequisites 2

A. Required construction acceptance tests and system cleaning are complete.

B. Required electrical power supplies and control circuits are operational.

C. Plant conditions are established and systems are available as necessary, to facilitate drawing samples from the sample points.

D. The turbine plant closed cooling water system is available to provide cooling water to the system sample coolers.

E. The service water system is available to supply water to precise cooling system.

14.2.12.1.159.3 Test Method 2

A. The operability of the sample systems is verified. Operability of the associated control circuits is verified.

B. System samples are obtained, and flows are recorded.

2 14.2.12.1.159.4 Acceptance Criteria

A. The operability of the sample systems is as per design.

B. Sample system flows are within design specifications.

2 14.2.12.1.160 Plant Security System

CONFIDENTIAL; (Procedure preparation and technical data will be controlled in country only).

2 14.2.12.1.161 BOP Engineered Safeguards (ESFAS)

NOTE

Due to the size of the diesel generator load sequencing and load shedding testing, it is not included in this test. It
2 is performed in test 5P-A-PE-02.

2 14.2.12.1.161.1 Objectives

A. To demonstrate the operability of the BOP ESFAS to initiate containment purge isolation, control room emergency ventilation isolation, fuel building ventilation isolation, auxiliary feedwater signal, main steam isolation manual actuation, auxiliary feedwater suction valve switchover to demineralized water storage tank, and steam generator blowdown and sample isolation signals on receipt of the associated input signals.

B. To verify BOP ESFAS loop response times.

C. To demonstrate the proper response of actuated components on receipt of containment purge isolation, control room emergency ventilation isolation, fuel building ventilation isolation, auxiliary feedwater signal, main steam isolation manual actuation, auxiliary feedwater suction valve switchover to demineralized water storage tank, and steam generator blowdown and sample isolation signals.

D. To demonstrate the coincidence and redundancy of the BOP ESFAS.

14.2.12.1.161.2 Plant Conditions and Prerequisites | 2

A. Required construction acceptance tests and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

C. All components actuated by the BOP ESFAS are available.

14.2.12.1.161.3 Test Method | 2

A. The ability of the BOP ESFAS to actuate containment purge isolation, control room emergency ventilation isolation, fuel building ventilation isolation, auxiliary feedwater signal, main steam isolation manual actuation, auxiliary feedwater suction valve switchover to demineralized water storage tank, and steam generator blowdown and sample isolation signals is verified on receipt of the required coincidence of the input signals for each redundant channel.

B. Input signals are initiated, and loop response times are verified.

C. Containment purge isolation, control room emergency ventilation isolation, fuel building ventilation isolation, auxiliary feedwater signal, main steam isolation manual actuation, auxiliary feedwater suction valve switchover to demineralized water storage tank, and steam generator blowdown and sample isolation signals are manually initiated,and the proper response of actuated components is verified.

14.2.12.1.161.4 Acceptance Criteria | 2

A. The BOP ESFAS actuates containment purge isolation, control room emergency ventilation isolation, fuel building ventilation isolation, auxiliary feedwater signal, main steam isolation manual actuation, auxiliary feedwater suction valve switchover to demineralized water storage tank, and steam generator blowdown and sample isolation signals when their associated input signals are received for each applicable channel.

B. BOP ESFAS loop response times are within design specifications.

C. Containment purge isolation, control room emergency ventilation isolation, fuel building ventilation isolation, auxiliary feedwater signal, main steam isolation manual actuation, auxiliary feedwater suction valve switchover to demineralized water storage tank, and steam generator blowdown and sample isolation signals actuate components in accordance with system design.

2| 14.2.12.1.162 Safeguards Test Without Blackout

2| 14.2.12.1.162.1 Objective. To verify proper response of the ESFAS to a safeguards actuation signal with offsite power available.

2| 14.2.12.1.162.2 Plant Conditions and Prerequisites

A. The ESFAS system and component checks completed as required to perform the test.

B. The emergency diesel generators are operational.

C. The reactor vessel head is not installed, and the reactor vessel internals are not in the vessel.

D. The refueling seal ring is installed.

E. Systems and/or components to be actuated during this test are operational.

2| 14.2.12.1.162.3 Test Method. Demonstrate the independence of the train A and train B safeguards loads and their actuation circuits, and the proper response of train A and train B safeguards loads to a safeguards actuation signal with offsite power available.

2| 14.2.12.1.162.4 Acceptance Criteria

A. Train A safeguards loads actuate as required with the Train B normal ac, emergency ac, and dc power supplies isolated.

B. Train B safeguards loads actuate as required with the Train A normal ac, emergency ac, and dc power supplies isolated.

C. Train A and B safeguards loads actuate as required in response to a safeguards signal.

14.2.12.1.163 Safeguards Test With Blackout 2

14.2.12.1.163.1 Objective. To verify proper response of the ESFAS to a safeguards actuation signal coincident with loss of offsite power. 2

14.2.12.1.163.2 Plant Conditions and Prerequisites 2

A. ESFAS system checks and component checks completed as required to perform the test.

B. The emergency diesel generators are operational.

C. The reactor vessel head is not installed, and the reactor vessel internals are not in the vessel.

D. The refueling seal ring is installed.

E. System and/or components to be actuated during this test are operational.

14.2.12.1.163.3 Test Method. Demonstrate the proper response of the emergency diesel generators and the train A and train B safeguards loads to a safeguards actuation signal coincident with a simulated loss of offsite power. 2

14.2.12.1.163.4 Acceptance Criteria. The emergency diesel generators and the train A and train B safeguards loads respond to a safeguards actuation signal coincident with a simulated loss of offsite power as required per the detailed test procedure. 2

14.2.12.1.164 Reactor Protection System Initial Energization

14.2.12.1.164.1 Objective. To perform the initial energization of the reactor protection system in a safe and orderly manner. 2

14.2.12.1.164.2 Plant Conditions and Prerequisites 2

A. The reactor protection system cabinets are installed and required Phase I testing is complete.

B. Power is available from the 120V a vital instrumentation busses.

C. Inputs (except for the power supply input) and outputs to the reactor protection system are disconnected.

2 14.2.12.1.164.3 <u>Test Method</u>. Initially energize the reactor protection system and verify satisfactory incoming power supply voltage.

2 14.2.12.1.164.4 <u>Acceptance Criteria</u>. Power supply voltages are within the limits specified in the approved test procedure.

2 14.2.12.1.165 Reactor Protection System Functional Test

2 14.2.12.1.165.1 <u>Objective</u>. Verify proper outputs from the reactor protection system in response to various inputs.

2 14.2.12.1.165.2 <u>Plant Conditions and Prerequisites</u>

A. The nuclear instrumentation cabinets are energized and available to provide inputs to the reactor protection system.

B. The nuclear steam supply system (NSSS) process cabinets are energized and available to provide inputs to the reactor protection system.

C. The reactor trip breaker preoperational test has been completed.

2 14.2.12.1.165.3 <u>Test Method</u>. Demonstrate proper operation of the reactor protection logic by simulating various inputs to the reactor protection system, and monitoring the corresponding outputs for proper response.

2 14.2.12.1.165.4 <u>Acceptance Criteria</u>. Output response of the reactor protection logic in the reactor protection system is satisfactory for various inputs per the approved test procedure.

14.2.12.1.166 Reactor Protection System Logic Test 2

14.2.12.1.166.1 Objectives

A. Verify the operability of the reactor protection train A and train B logic cabinets.

B. Verify the operability of the installed testing panels in the reactor protection system.

14.2.12.1.166.2 Plant Conditions and Prerequisites 2

A. The instrument inverters are installed and required Phase I testing is complete.

B. Input power is available to the reactor protection system and reactor protection system output to the reactor trip switchgear under voltage coils is available; all other inputs and outputs to the reactor protection system are isolated.

14.2.12.1.166.3 Test Method 2

A. Demonstrate proper response of the reactor protection train A and train B logic cabinets to internal test signals.

B. Demonstrate proper response of the installed test panels in the reactor protection system to internal test signals.

14.2.12.1.166.4 Acceptance Criteria 2

A. The reactor protection train A and train B logic cabinets respond to internal test signals as required in the approved test procedure.

B. The installed testing panels in the protection system respond to internal test signals as required in the approved test procedure.

14.2.12.1.167 Reactor Trip Switchgear Test 2

14.2.12.1.167.1 Objective. Verify proper operation of the control functions and interlocks associated with the reactor trip switchgear. 2

2| 14.2.12.1.167.2 Plant Conditions and Prerequisites

A. Required sections of the main control board and annunciator panels are installed and required Phase I testing is complete.

B. The solid-state protection system logic test has been completed.

2| 14.2.12.1.167.3 Test Method. Demonstrate proper tripping and closing schemes by local and remote actuation of reactor switchgear.

2| 14.2.12.1.167.4 Acceptance Criteria. Control circuitry and interlocks operate as described in chapter 7 and the approved test procedure.

2| 14.2.12.1.168 Reactor Protection Time Response Test

2| 14.2.12.1.168.1 Objective. Verify that reactor protection system response times are less than maximum allowable times specified in technical specifications.

2| 14.2.12.1.168.2 Plant Conditions and Prerequisites

A. Test is to be performed prior to fuel load.

B. Instrumentation and reactor protection system checks and calibrations completed as required.

2| 14.2.12.1.168.3 Test Method. Utilizing test panels and temporary instrumentation as required, measure the time response in each trip path in the reactor protection circuitry.

2| 14.2.12.1.168.4 Acceptance Criteria. Response times of the individual trip paths are less than the maximum allowable times specified in the technical specifications.

2| 14.2.12.1.169 Containment Isolation

2| 14.2.12.1.169.1 Objective. Verify the capability of the containment isolation system to respond properly to phase A and phase B containment isolation signals.

14.2.12.1.169.2 Plant Conditions and Prerequisites 2

A. The solid-state protection functional test has been completed satisfactorily.

B. Systems and components required to perform this test are completed to the extent necessary to conduct this test.

14.2.12.1.169.3 Test Method. Demonstrate the proper response of components in the containment isolation system to phase A and phase B containment isolation signals. 2

14.2.12.1.169.4 Acceptance Criteria. Components in the containment isolation system respond properly to phase A and phase B containment isolation signals in accordance with subsection 6.2.4 and the approved test procedure. 2

14.2.12.1.170 Safeguards Test Cabinet Energization and Test Relay Functional Test 2

14.2.12.1.170.1 Objective. Perform the initial energization and test relay functional checks for the safeguards test cabinet in a safe and orderly manner.

14.2.12.1.170.2 Plant Conditions and Prerequisites 2

A. The safeguards test cabinet is installed, and required Phase I testing is complete.

B. The vital 125V ac instrument buses are operational and available to supply power to the safeguards test cabinet.

14.2.12.1.170.3 Test Method. Initially energize the safeguards test cabinet and perform a functional checkout of the test relays. 2

14.2.12.1.170.4 Acceptance Criteria. The test relays in the safeguards test cabinet respond as required in the approved detailed test procedure. 2

2 14.2.12.1.171 Safeguards Test Cabinet Preoperational Test

14.2.12.1.171.1 Objective. Verify operability of the safeguards test cabinets.

2 14.2.12.1.171.2 Plant Conditions and Prerequisites

A. The safeguards test cabinet energization and test relay functional procedure has been completed.

B. The solid-state protection system functional test has been completed.

2 14.2.12.1.171.3 Test Method. Demonstrate the operability of the safeguards test cabinet, and the capability to perform periodic testing on required circuitry.

2 14.2.12.1.171.4 Acceptance Criteria. Safeguards test cabinets perform as required in the approved detailed test procedure.

2 14.2.12.1.172 Process Protection and Control Cabinet Initial Energization

2 14.2.12.1.172.1 Objective. Verify operability of the process rack power supplies.

2 14.2.12.1.172.2 Plant Conditions and Prerequisites

A. The eight NSSS process racks are installed and required Phase I testing is complete.

B. The 120V ac inverters supplying power to the NSSS process racks are available.

C. Inputs and outputs other than 125V ac input power are disconnected.

2 14.2.12.1.172.3 Test Method

A. Disconnect the circuit boards in the process racks.

B. Close the breakers for each process control rack and record power supply voltages.

14.2.12.1.172.4 Acceptance Criteria. Power supply voltages for each process control rack are within the limits specified in the approved test procedure. |2

14.2.12.1.173 Area Radiation Monitoring |2

14.2.12.1.173.1 Objective. Demonstrate the operation of the area radiation monitors and to verify that a high radiation signal at each monitor will initiate an alarm. |2

14.2.12.1.173.2 Plant Conditions and Prerequisites |2

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

14.2.12.1.173.3 Test Method. A calibration source is utilized to actuate the area radiation monitors and their operability and associated alarms are verified. |2

14.2.12.1.173.4 Acceptance Criteria. Each area radiation monitor actuates the associated alarms on receipt of a high radiation signal. |2

14.2.12.1.174 Nuclear Instrumentation Initial Energization and Calibration |2

14.2.12.1.174.1 Objective. To perform the initial energization and alignment of the nuclear instrumentation system in a safe and orderly manner.

14.2.12.1.174.2 Plant Conditions and Prerequisites |2

A. The nuclear instrumentation system is installed.

B. The vital 125V ac instrument buses are operational and available to supply power to the nuclear instrumentation system.

14.2.12.1.174.3 Test Method. Initially energize the nuclear instrumentation system and perform an initial alignment. |462 |2

2 14.2.12.1.174.4 Acceptance Criteria. The nuclear instrumentation system is alignable and responds as required in the approved detailed test procedure.

14.2.12.1.175 Nuclear Instrumentation Preoperational Test

2 14.2.12.1.175.1 Objective. To verify that the nuclear instrumentation system performs the required indication, alarm, and protection functions for the source, intermediate, and power ranges.

2 14.2.12.1.175.2 Plant Conditions and Prerequisites

A. The nuclear instrumentation energization and initial alignment test has been completed.

B. The solid-state protection system logic test has been completed.

2 14.2.12.1.175.3 Test Method. Demonstrate proper functioning of the alarms, indicators, and protection functions associated with the source, intermediate, and power ranges.

2 14.2.12.1.175.4 Acceptance Criteria. Alarms, indicators, and protection functions for the source, intermediate, and power ranges respond as required in the approved detailed test procedure.

2 14.2.12.1.176 Rod Control System

2 14.2.12.1.176.1 Objective

A. Ensure proper connection, identification and continuity of the Rod Control System Power and Control Cabling.

B. The operation of control rod drive mechanism will be demonstrated.

C. Verify each unit of the system functions properly.

2 14.2.12.1.176.2 Plant Conditions and Prerequisites. Ambient conditions following core loading and before initial criticality.

14.2.12.1.176.3 Test Method 2

A. Visually check connection and identification of and measure resistance of each power and control cable.

B. During the installation check of each system, it is energized and operationally checked out with mechanisms connected to each power supply. The ability of the system to stop the mechanism is verified.

14.2.12.1.176.4 Acceptance Criteria. All connected and routed in accordance with the applicable drawings. Continuity checks have been sucessfully completed for each cable and connector. 2

14.2.12.1.177 Rod Position Indication System 2

14.2.12.1.177.1 Objectives. Demonstrate that the rod position indication system satisfactorily performs required indication and alarm functions for each individual rod and that each rod operates satisfactorily over its entire range of travel. 2

14.2.12.1.177.2 Plant Conditions and Prerequisites 2

A. Reactor at hot shutdown no-load operating temperature and pressure.

B. At least one reactor coolant pump in service with reactor coolant boron concentration not less than specified in the technical specifications for refueling shutdown.

14.2.12.1.177.3 Test Method 2

A. All rod banks will be fully withdrawn by bank in 20-step increments while recording analog output voltage, control room position readout, and the group step position indication.

B. In addition, the pulse-to-analog converter chassis bank position digital readout will be the recorder for all control rod banks.

14.2.12.1.177.4 Acceptance Criteria. The rod position indication alarm functions, and each rod operates over its entire range of travel within the limits of the rod position indication instruction manual and the plant precautions, limitations, and setpoints manual. 2

2 14.2.12.1.178 Seismic Instrumentation

2 14.2.12.1.178.1 <u>Objective</u>. Demonstrate the operability of the seismic triggers and switches and strong motion accelerometers, including their associated alarms and recording and playback systems.

2 14.2.12.1.178.2 <u>Plant Conditions and Prerequisites</u>

A. Required construction acceptance tests and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

2 14.2.12.1.178.3 <u>Test Method</u>. A test signal is initiated, and the operability of the seismic triggers, switches, and strong motion accelerometers, including their associated alarms, recording and playback systems, is verified.

2 14.2.12.1.178.4 <u>Acceptance Criteria</u>. The seismic triggers, switches, and strong motion accelerometers, including their associated alarms, recording, and playback systems, operate in accordance with system design specifications.

2 14.2.12.1.179 Process Radiation Monitoring System

2 14.2.12.1.179.1 <u>Objective</u>. Demonstrate the ability of the process radiation monitoring system to provide alarm and isolation signals, as applicable, upon receipt of high radiation signals. Operability of the radioactivity monitoring control room microprocessor is verified.

2 14.2.12.1.179.2 <u>Plant Conditions and Prerequisites</u>

A. Required construction acceptance tests are complete.

B. Required electrical power supplies and control circuits are available and operational.

2 14.2.12.1.179.3 <u>Test Method</u>

A. The check source for each monitor is remotely positioned, and the actuation of each monitor, and the operability of its associated alarms and isolation signals, are verified.

B. Operability of the radioactivity monitoring control room microprocessor is verified.

14.2.12.1.179.4 Acceptance Criteria. The process radiation monitoring system provides alarm and isolation signals, in accordance with system design specifications. |2

14.2.12.1.180 Thermal Expansion Test (Balance of Plant) |2

14.2.12.1.180.1 Objectives |2

A. Demonstrate during the heatup to hot functional temperature that the systems' piping can expand without obstruction, and that expansion is in accordance with design.

B. Demonstrate that during the subsequent cooldown to ambient temperature the piping returns to its approximate cold position.

14.2.12.1.180.2 Plant Conditions and Prerequisites |2

A. Reference points for measurement of the systems are established.

B. Thermocouples and strain-monitoring instrumentation are calibrated and installed.

C. All temporary hangers are removed and permanent hangers are installed with lock pins removed and expansion clearances set to the proper cold values.

D. All subject systems are available for heatup during hot functional testing.

14.2.12.1.180.3 Test Method |2

A. Record cold base line data.

B. Obtain measurement data at various specified temperature plateaus during heatup. Stop the heatup if any excessive movement is encountered.

C. On completion of cooldown to ambient temperature, obtain measurement data.

2 14.2.12.1.180.4 Acceptance Criteria

A. There is no evidence of blocking of the thermal expansion of any piping or components, other than by design.

B. Pipe stresses, pipe support, and nozzle loads, measured at the monitored areas, do not exceed their code-allowable limits at the test or design conditions.

C. Spring hanger movement must remain within the hot and cold setpoints, and snubbers must not become fully retracted or expanded.

D. Piping and components must return to their approximate baseline position on cooldown.

2 14.2.12.1.181 Steady-State Vibration and Transient Effects (Balance of Plant)

2 14.2.12.1.181.1 Objectives

A. Demonstrate that flow-induced vibrations produced in selected system piping during normal operation is acceptable.

B. Demonstrate that transient effects during normal operations do not produce excessive vibrations in selected systems of piping and components.

2 14.2.12.181.2 Plant Conditions and Prerequisites

A. Required component testing and instrument calibrations are complete.

B. Applicable systems have been walked through and verified complete to the extent required to conduct this test.

C. All temporary hangers have been removed and replaced with permanently installed hangers for the systems involved, prior to starting the test on the particular system.

2 14.2.12.1.181.3 Test Method

A. Visually inspect the applicable piping while the system is operating at normal steady-state conditions. If vibration is visually detected, test it with a portable vibration monitor and consult a qualified stress engineer to determine the acceptability of the piping or system under test.

B. Induce transients by starting and stopping pumps or charging flow paths in applicable systems, and visually observe results. Perform instrumented analysis of line/component if necessary for further verification.

14.2.12.1.181.4 Acceptance Criteria 2

A. No unacceptable vibrations exist in the applicable system piping during normal steady-state or transient operations.

B. Spring-hanger movement remains within the hot and cold setpoints, and snubbers are neither fully retracted or expanded.

C. Piping and components return to their approximate baseline position on cooldown.

14.2.12.1.182 Steady-State and Dynamics Effects During Hot Functional Test 2

14.2.12.1.182.1 Objective. To verify satisfactory pipe support and restraints for various NSSS systems during steady-state and transient conditions.

14.2.12.1.182.2 Plant Conditions and Prerequisites 2

A. Required pipe supports and restraints necessary to perform this test have been installed, and required Phase I testing has been completed.

B. Hot functional testing is in progress.

14.2.12.1.182.3 Test Method. Visual examinations of various NSSS systems during both steady-state and transient conditions will be made by qualified observer during hot functional test (HFT). 2

14.2.12.1.182.4 Acceptance Criteria. The qualified observer will evaluate the long-term effects of any system vibration on the structural integrity of the system. If structural integrity will be degraded below an acceptable limit, corrective action will be taken. 2

2 14.2.12.1.183 Thermal Expansion Test (Westinghouse-Supplied Restraints)

2 14.2.12.1.183.1 Objectives

A. Verify that the applicable systems piping can expand without obstruction from Westinghouse-supplied hangers and restraints during initial heatup to normal operating conditions.

B. Verify that applicable systems piping returns to its approximate baseline cold position after cooldown to ambient conditions.

2 14.2.12.1.183.2 Plant Conditions and Prerequisites

A. All required Westinghouse-supplied hangers and restraints are installed prior to hot functional test.

B. Expansion clearances have been set to the proper cold values. 462

C. Reference points for measurements have been established.

2 14.2.12.1.183.3 Test Method

A. Record cold baseline data.

B. Record measurements at various temperature plateaus during hot functional heatup to normal operating temperature.

C. Record measurements following reactor system cooldown from hot functional.

2 14.2.12.1.183.4 Acceptance Criteria

A. Piping movements do not cause piping rubs or interference with other equipment.

B. Piping movements do not cause undue stresses as determined by inspection.

C. Piping returns to its approximate baseline condition on cooldown.

14.2.12.1.184 AAC Power Test

14.2.12.1.184.1 Objective

A. To demonstrate that the AAC power is capable of providing the required power to equipment vital to safe reactor shutdown within 10 minutes under station blackout of one unit among the 4 units.

B. To verify interlocking to permit control of the AAC diesel generator from only one unit at a time.

14.2.12.1.184.2 Prerequisites

A. Required construction acceptance tests are complete 314

B. Required electrical power supplies and control circuits are available.

C. Required mechanical systems associated with the AAC diesel generator systems are available.

D. Required 4.16KV systems, 480V load center, and 480V motor control centers are available

E. The emergency diesel generator circuit breaker is not connected to the Class 1E 4.16KV bus which will be connected to the AAC diesel generator.

14.2.12.1.184.3 Test Method

A. Demonstrate manual AAC diesel generator starting.
Record the time required to supply power to the Class 1E 4.16KV bus.

14.2.12.1.184.4 Acceptance Criteria

A. Manual starting of an AAC diesel generator are accomplished per Section 8.3 and the time required for AAC diesel generator to supply power to the Class 1E 4.16KV bus is in accordance with Section 8.3. 314

B. Controls, interlocks, indicators, and alarms function in accordance with system design.

14.2.12.2 Safety-Related Power Ascension Test Abstracts

The following paragraphs contain the test abstracts for each safety-related power ascension test.

14.2.12.2.1 Core Loading Prerequisites and Periodic Checkoff 2

14.2.12.2.1.1 Objectives

A. Demonstrate that all prerequisites for fuel loading have been satisfied.

B. Generate appropriate checklists to be used during fuel loading for plant status verification.

14.2.12.2.1.2 Plant Conditions and Prerequisites. The RCS is in a cold shutdown condition.

14.2.12.2.1.3 Test Method. Check status of each system or item listed in the prerequisite checkoff list by visual inspection and/or operation.

14.2.12.2.1.4 Acceptance Criteria. All prerequisites to fuel loading are satisfied in accordance with the FSAR.

14.2.12.2.2 Reactor Coolant System Boron Concentration Sampling 2

14.2.12.2.2.1 Objective. Verify proper and uniform boron concentration in the reactor coolant and associated auxiliary systems prior to core loading.

14.2.12.2.2.2 Plant Conditions and Prerequisites

A. The RCS has been filled with borated reactor grade water.

B. The chemical and volume control system (CVCS), containment spray system (CSS), SIS, RHR system, and the component cooling water system (CCWS) are operable.

14.2.12.2.2.3 Test Method. Various locations in the RCS, CVCS, RHR system, RWST, SIS, and the CSS will be sampled and analyzed for boron concentration.

14.2.12.2.2.4 Acceptance Criteria. Boron concentration samples meet the requirements for initial fuel loading specified in the detailed test procedure.

2 14.2.12.2.3 Core Loading Instrumentation and Neutron Source Requirements

14.2.12.2.3.1 Objective

A. To verify proper alignment and calibration of the Temporary Core Loading Instrumentation (TCLI) prior to the start of fuel loading.

B. To check the neutron response of the temporary core
1 loading instrumentation and the plant NIS source range channels prior to the start of fuel loading.

C. To check the neutron response of the temporary core loading instrumentation and the plant NIS source range instrumentation prior to resumption of fuel loading following any delay of eight hours or more.

14.2.12.2.3.2 Plant Conditions and Prerequisites

A. Hot functional testing has been completed and the plant is being prepared for initial core loading.

B. The TCLIS package is available on site and ready to be calibrated and placed in position as specified.

14.2.12.2.3.3 Test Method. To verify the calibration of the TCLIS done prior to shipment, determine, in the field, high voltage and discriminator settings and compare them with the pre-shipment settings for conformity. This will be done with a neutron source of 1-5 curies. In addition, the neutron response of the TCLIS and NIS source ranges will be checked prior to fuel loading or following any delay of greater than eight hours with a neutron source. 1

14.2.12.2.3.4 Acceptance Criteria.

A. The results obtained during the field checkout of the temporary core loading instrumentation agree with the results from the pre-shipment shop checkout (HV settings and Discriminator settings).

B. The TCLI and the plant NIS source range channels must indicate a definite change in count rate as the neutron level is varied near the responding detector during the neutron response check required prior to initial fuel loading.

C. The neutron response of all detectors must provide a positive indication of operability during the detector response recheck required prior to resumption of fuel loading following any delay of eight hours or more.

14.2.12.2.4 Initial Fuel Loading 2

14.2.12.2.4.1 Objective. Specify the sequence of loading fuel assemblies into the core, and identify the nuclear monitoring channels to be used for each step in the core loading sequence:

14.2.12.2.4.2 Plant Conditions and Prerequisites

A. Required Phase II testing on the refueling machine has been completed.

B. The core loading instrumentation check has been completed satisfactorily.

1 C. The reactor coolant system has been filled and meets chemistry, boron and temperature requirements ($T \leq 54C$).

14.2.12.2.4.3 Test Method. Load fuel assemblies into the core in accordance with the detailed core loading sequence specified in the approved detailed test procedure. Record the fuel assembly identification number, enrichment, and type of insert for each core location. Status of core reactivity is maintained through plots of the inverse count-rate ratio (ICRR).

14.2.12.2.4.4 Acceptance Criteria. Satisfactory completion of the steps in section seven of the detailed test procedure with no damage to any fuel assembly.

14.2.12.2.5 Incore Movable Detector System Checkout

2

14.2.12.2.5.1 Objective. Verify proper operation of the incore flux mapping system prior to initial criticality.

14.2.12.2.5.2 Plant Conditions and Prerequisites

A. The incore flux mapping system has been installed and required Phase I testing is complete.

B. Initial fuel loading has been completed, and the reactor vessel head has been installed and torqued as required.

14.2.12.2.5.3 Test Method. Demonstrate proper operation of the limit switches, function indicator lights, and drive assemblies associated with the incore movable detector system.

14.2.12.2.5.4 Acceptance Criteria. Limit switches, function indicator lights, and drive assemblies associated with the incore moveable detector system respond as required in the approved detailed test procedure.

14.2.12.2.6 Control Rod Drive Mechanism Operation Test (Cold) 1 2

14.2.12.2.6.1 Objectives

A. To provide documentation for the verificaton of proper slave cycler timing and mechanism operation.

B. Verify the operability of each control rod drive mechanism (CRDM) with a rod cluster control assembly (RCCA) attached, prior to initial use of the mechanisms under cold plant conditions.

14.2.12.2.6.2 Plant Conditions and Prerequisites

A. Initial fuel load has been completed and all drive rod assemblies have been attached to their respective rod cluster control assembly.

B. All required Phase I and Phase II testing on the rod control system has been completed satisfactorily. 1

C. The RCS is filled, vented, and in a cold shutdown mode with RCS pressure at least 24.61 kg/cm^2 (350 psig).

14.2.12.2.6.3 Test Method. Record traces of lift coil current, movable gripper coil current, stationary gripper coil current, and sound impulses from a sound pickup attached to the mechanism for each control rod drive mechanism from normal rod withdraw and insert action.

14.2.12.2.6.4 Acceptance Criteria.

A. Each slave cycler must provide its associated power cabinet with the appropriate command signals to obtain the proper mechanism timing during control rod withdrawal and insertion operations as shown in the approved test procedure.

B. The operability of each CRDM must be verified by a demonstration of drive line withdrawal and insertion.

2 14.2.12.2.7 Rod Drop Time Measurements (Cold)

14.2.12.2.7.1 Objective. Verify proper drop time for each full length rod control cluster assembly with the RCS in a cold shutdown condition.

14.2.12.2.7.2 Plant Conditions and Prerequisites

A. Initial fuel loading has been completed and RCS boron concentration is greater than or equal to the concentration required for refueling.

B. The control rod drive mechanism timing test has been completed satisfactorily.

C. The RCS is filled and vented, and in a cold shutdown mode.

14.2.12.2.7.3 Test Method

For each control rod, record the drop time by monitoring the RPI detector primary winding with a high speed recorder (such as a visicorder) following the deenergization of the stationary winding in a cold no-flow condition and in a cold full-flow condition.

14.2.12.2.7.4 Acceptance Criteria. Rod drop times for each control rod meet the requirements of the approved detailed test procedure.

14.2.12.2.8 Vibration and Loose Parts Monitoring (Cold)

2

14.2.12.2.8.1 Objective. Verify the absence of abnormal vibration or unusual noises in the RCS.

14.2.12.2.8.2 Plant Conditions and Prerequisites

A. The loose parts monitoring system has been installed and the required Phase I and Phase II tests have been completed.

B. The RCS is filled and vented and in a cold shutdown mode.

14.2.12.2.8.3 Test Method. Monitor the RCS using the loose parts monitoring system to detect any abnormal vibration or noises.

14.2.12.2.8.4 Acceptance Criteria. No abnormal vibration or unusual noises are discovered in the RCS.

14.2.12.2.9 Control System Test for Turbine Runback Operation (NSSS only) 2

14.2.12.2.9.1 Objective. Demonstrate proper operation of the electro-hydraulic control system.

14.2.12.2.9.2 Plant Conditions and Prerequisites

A. Required Phase I and Phase II testing is complete.

B. The RCS is filled and vented and in a cold shutdown condition.

14.2.12.2.9.3 Test Methods. Verify proper operation of the turbine electro-hydraulic control system upon actuation by a simulated turbine runback signal from overpower and/or over-temperature.

14.2.12.2.9.4 Acceptance Criteria. The turbine runback control system operates in accordance with the design specifications.

14.2.12.2.10 Incore Temperature Controller and Resistance Temperature Detector Cross-Calibration 2

14.2.12.2.10.1 Objective. Verify the proper response of reactor coolant resistance temperature detectors (RTD) and fixed incore thermocouples.

14.2.12.2.10.2 Plant Conditions and Prerequisites

A. Reactor coolant RTDs and fixed incore thermocouples are installed and the required Phase I testing is complete.

B. The RCS is in a hot standby mode with RCS temperature stable.

14.2.12.2.10.3 <u>Test Method</u>

A. Measure and plot resistance versus temperature for all RTD's. Determine variation between each RTD and the average of the RTD readings at hot isothermal conditions.

B. Measure and plot voltage versus temperature for all T/C's and generate individual hot isothermal correction factors.

C. Observe operation of temperature instrumentation during test.

14.2.12.2.10.4 <u>Acceptance Criteria</u>. Reactor coolant RTDs detectors and fixed incore thermocouple readings are within allowable tolerances at the various temperature plateaus during RCS heatup.

2 14.2.12.2.11 Reactor Coolant System Leak Rate Test

14.2.12.2.11.1 <u>Objective</u>. Verify that unidentified leakage sources from the RCS are within technical specification limits.

14.2.12.2.11.2 <u>Plant Conditions and Prerequisites</u>

A. Initial core loading has been completed satisfactorily.

B. Reactor coolant system temperature is stable while recording data for this test.

C. The RCS is in hot standby.

14.2.12.2.11.3 <u>Test Method</u>. Record makeup flow to the RCS and compare this with known leakage from the RCS.

14.2.12.2.11.4 <u>Acceptable Criteria</u>. Sources of unidentified leakage from the RCS are within technical specification limits.

14.2.12.2.12 Rod Position Indication System Test |2

14.2.12.2.12.1 Objective. Verify that the digital rod position indication system performs the required indication and alarm functions for each individual control rod.

14.2.12.2.12.2 Plant Conditions and Prerequisites

A. The digital rod position indication system is installed and required Phase I and Phase II testing is complete.

B. The plant is at hot standby, no-load operating temperature and pressure with boron concentration equal to or greater than the concentration required for refueling.

C. The nuclear instrumentation source range channels are in operation.

14.2.12.2.12.3 Test Method. Withdraw and insert each control rod bank and compare rod position indication for each rod in the bank with the group step counter position indicator associated with each rod.

14.2.12.2.12.4 Acceptance Criteria. The digital rod position indication system control board display for each rod must agree with the rods associated with the group step counter indicator, as specified in the approved detailed test procedure.

14.2.12.2.13 Reactor Coolant System Flow Measurement |2

14.2.12.2.13.1 Objectives. To obtain the necessary data to interrelate reactor coolant pump input power and reactor coolant loop elbow tap differential pressure as a measurement of reactor coolant system flow rate, confirming that reactor coolant system flow is equal to or greater than design.

14.2.12.2.13.2 Plant Conditions and Prerequisites

A. Required component testing and instrument calibration are complete.

B. Required electrical power supplies and control circuits are operational.

C. The reactor core is installed, and the plant is at normal operating temperature and pressure prior to initial criticality.

14.2.12.2.13.3 Test Method. Data are taken for various reactor coolant pump configurations, and reactor coolant system flow is calculated.

14.2.12.2.13.4 Acceptance Criteria. Reactor coolant flow rate in each loop is equal to or greater than design.

14.2.12.2.14 Reactor Coolant System Flow Coastdown

2

14.2.12.2.14.1 Objective. Verify that RCS flow coastdown rate after reactor coolant pumps are stopped is acceptable.

14.2.12.2.14.2 Plant Conditions and Prerequisites

A. Initial fuel loading has been completed satisfactorily.

B. The RCS is in a hot standby mode.

C. All reactor coolant pumps are operable.

14.2.12.2.14.3 Test Method. Trip reactor coolant pumps from various pump and breaker configurations and measure required flow data and response time.

14.2.12.2.14.4 Acceptance Criteria. Reactor coolant system flow coastdown rates meet the requirements specified in the approved detailed test procedure.

14.2.12.2.15 Resistance Temperature Detector Bypass Loop
2 Flow Verification

14.2.12.2.15.1 Objectives

A. Verify proper flow rates in each reactor coolant resistance temperature detector (RTD) bypass loop.

B. Verify proper functioning of system alarms in each RTD loop.

14.2.12.2.15.2 Plant Conditions and Prerequisites

A. Resistance temperature detector bypass loop flow analysis has been completed and any flow-limiting orifices required have been installed.

B. The RCS is in a hot standby mode.

C. Flow instrumentation in each RTD bypass loop has been calibrated.

14.2.12.2.15.3 Test Method

A. Measure flow in each RTD bypass loop.

B. Simulate system alarm conditions to verify response of system alarm circuitry.

14.2.12.2.15.4 Acceptance Criteria

A. Flow rates in each RTD bypass loop are in accordance with design specifications.

B. Alarm circuits respond as required to simulated alarm conditions.

14.2.12.2.16 Pressurizer Effectiveness Test 2

14.2.12.2.16.1 Objectives

A. Establish proper continuous pressurizer spray flow rates.

B. Verify pressurizer normal control spray and heater effectiveness.

14.2.12.2.16.2 Plant Conditions and Prerequisites

A. Initial core loading has been completed satisfactorily.

B. The RCS is in hot standby at approximately no-load temperature and pressure.

14.2.12.2.16.3 Test Method

A. Adjust the pressurizer spray bypass valves until temperatures in the pressurizer spray line indicate a continuous flow through each pressurizer spray bypass valve.

B. Demonstrate pressurizer spray effectiveness by initiating spray and reducing RCS pressure. Demonstrate heater effectiveness by energizing heaters (with spray control in manual) and increasing RCS pressure.

C. Demonstrate that a pressure transient terminates at S.I. block pressure by closing spray valves.

14.2.12.2.16.4 Acceptance Criteria

A. Each pressurizer spray bypass valve has been positioned to maintain temperatures in each pressurizer spray line in accordance with the approved test procedure.

B. Pressurizer spray and heater effectiveness are in accordance with design requirements and the approved test procedure.

2 14.2.12.2.17 Control Rod Drive Mechanism Operation Test (Hot)

14.2.12.2.17.1 Objectives

A. To provide documentation for the verification of proper slave cycler timing and mechanism operation.

B. Verify the operability of each control rod drive mechanism (CRDM) with a rod cluster control assembly (RCCA) attached, prior to initial use of the mechanisms
1 under cold plant conditions.

14.2.12.2.17.2 Plant Conditions and Prerequisites

A. Initial fuel load has been completed and all drive rod assemblies have been attached to their respective rod cluster control assembly.

B All required Phase I and Phase II testing on the rod control system has been completed satisfactorily.

C. The RCS is filled, vented, and in a cold shutdown mode with RCS pressure at least 24.61 kg/cm^2 (350 psig).

14.2.12.2.17.3 Test Method. Record traces of lift coil current, movable gripper coil current, stationary gripper coil current, and sound impulses from a sound pickup attached to the mechanism for each control rod drive mechanism from normal rod withdraw and insert action.

14.2.12.2.17.4 Acceptance Criteria. 1

A. Each slave cycler must provide its associated power cabinet with the appropriate command signals to obtain the proper mechanism timing during control rod withdrawal and insertion operations as shown in the approved test procedure.

B. The operability of each CRDM must be verified by a demonstration of drive line withdrawal and insertion.

14.2.12.2.18 Rod Drop Time Measurements (Hot) 2

14.2.12.2.18.1 Objective. Verify proper drop time for each full length rod control cluster assembly under hot plant conditions.

14.2.12.2.18.2 Plant Conditions and Prerequisites

A. The RCS is in a hot standby mode.

B. The nuclear instrumentation system is in service.

C. Rod drop time measurements during cold plant conditions have been completed satisfactorily.

14.2.12.2.18.3 Test Method. For each control rod record the drop time by monitoring the RPI detector primary winding with a high speed recorder following deenergization of the stationary winding in a hot no-flow condition and in a hot full-flow condition.

14.2.12.2.18.4 Acceptance Criteria. Rod drop times for each control rod meet the requirements of the approved detailed test procedure.

2 14.2.12.2.19 Rod Control Test

14.2.12.2.19.1 Objective. Verify that the rod control system satisfactorily performs the required control and indication functions in order to verify the system's operability prior to initial criticality.

14.2.12.2.19.2 Plant Conditions and Prerequisites

A. The RCS is in hot standby at approximately no-load temperature and pressure.

B. The rod control system and digital rod position indication (DRPI) system are in service.

C. The nuclear instrumentation source range channels are operable.

D. Reactor coolant system boron concentration is greater than or equal to the concentration required for refueling shutdown.

14.2.12.2.19.3 Test Method. Demonstrate proper rod withdrawal and insertion for each shutdown and control bank rod group, and that control bank overlap is satisfactory.

14.2.12.2.19.4 Acceptance Criteria. The control and indication functions of the rod control system respond as required in the approved detailed test procedure.

2 14.2.12.2.20 Initial Setpoint Verification

14.2.12.2.20.1 Objective. Verify that all protection system setpoints are proper.

14.2.12.2.20.2 Plant Conditions and Prerequisites

A. Initial fuel loading has been completed satisfactorily.

B. All instrument setpoint calibrations required for initial criticality have been completed.

14.2.12.2.20.3 Test Method. Review the latest instrument calibration data sheets to determine protection system setpoints.

14.2.12.2.20.4 Acceptance Criteria. Protection system setpoints are within the limits specified in the detailed test procedure.

14.2.12.2.21 Chemical Test at Power |2

14.2.12.2.21.1 Objective. Demonstrate the ability to control water quality.

14.2.12.2.21.2 Plant Conditions and Prerequisites. The RCS is at equilibrium conditions at various power levels.

14.2.12.2.21.3 Test Method. Primary and secondary systems sampling are performed and analysis done.

14.2.12.2.21.4 Acceptance Criteria. RCS and secondary water quality are within specifications.

14.2.12.2.22 Dynamic Automatic Steam Dump Control Test |2

14.2.12.2.22.1 Objective. Verify proper dynamic operation of the steam dump system.

14.2.12.2.22.2 Plant Conditions and Prerequisites

A. The steam dump control system has been checked out and calibrated.

B. A normal condenser vacuum has been established.

C. The reactor is critical at no-load temperature and pressure, and in a condition to permit an increase in core power to 15 percent.

14.2.12.2.22.3 Test Method. Demonstrate proper response of the automatic steam dump control system turbine trip controller, loss-of-load controller, and steam pressure controller to various transients.

14.2.12.2.22.4 Acceptance Criteria. The turbine trip controller and loss-of-load controller respond properly to maintain a stable T_{avg}. The steam pressure controller respond properly to maintain a stable pressure at the normal no-load pressure.

2 14.2.12.2.23 Secondary System Warmup

14.2.12.2.23.1 Objective. Establish proper conditions in the secondary system in anticipation of the turbine-generator startup.

14.2.12.2.23.2 Plant Conditions and Prerequisites

A. Required Phase I and Phase II testing is complete.

B. The RCS is in a hot no-load condition.

14.2.12.2.23.3 Test Method. Steam is supplied to the turbine seals and condenser air ejectors to establish vacuum.

14.2.12.2.23.4 Acceptance Criteria. Main steam bypass valves are operational and condenser vacuum has been established.

2 14.2.12.2.24 Initial Turbine Roll and Turbine Checks

14.2.12.2.24.1 Objective. Provide NSSS guidelines and restrictions during initial turbine roll and turbine checks.

14.2.12.2.24.2 Plant Conditions and Prerequisites

A. The main turbine has been installed and checked out.

B. A normal condenser vacuum has been established.

C. Perform during the hot-functional test condition.

14.2.12.2.24.3 Test Method. Specific guidelines and restrictions will be detailed for various NSSS parameters (i.e., T_{avg}, during initial turbine roll and turbine checks.

14.2.12.2.24.4 Acceptance Criteria. Initial turbine roll and turbine checks are completed without exceeding the guidelines and restrictions detailed in the approved test procedure.

14.2.12.2.25 Turbine Control System Checkout 2

14.2.12.2.25.1 Objective. To adjust the turbine control system to provide proper turbine load-change feedback signals to the reactor control systems.

14.2.12.2.25.2 Plant Conditions and Prerequisites

A. The reactor is at equilibrium conditions greater than zero percent.

B. Required Phase I and Phase II testing is complete.

14.2.12.2.25.3 Test Method. Using turbine impulse-stage pressure controller simulated outputs, align the turbine control system to provide the appropriate feedback signal to the reactor control system.

14.2.12.2.25.4 Acceptance Criteria. Reactor control system is responsive to the turbine feedback signal, and the feedback circuitry has been calibrated in accordance with operating instructions.

14.2.12.2.26 Turbine Overspeed Trip Test 2

14.2.12.2.26.1 Objectives

A. Demonstrate the turbine overspeed setpoint is correct.

B. Determine the turbine oil pressure during a simulated overspeed condition.

14.2.12.2.26.2 Plant Conditions and Prerequisites

A. The reactor is at equilibrium conditions at a power level of 10 percent.

B. The turbine control system is installed calibrated and operable.

14.2.12.2.26.3 Test Method

A. Demonstrate the overspeed trip.

B. Apply control oil to the overspeed trip mechanism until the mechanism activates.

14.2.12.2.26.4 Acceptance Criteria. Turbine overspeed trip operates in accordance with the design specifications.

2 14.2.12.2.27 Turbine-Generator Checkout

14.2.12.2.27.1 Objective. Demonstrate the turbine generator operates satisfactorily in accordance with manufacturer's recommended operating procedures.

14.2.12.2.27.2 Plant Conditions and Prerequisites

A. Required Phase I and Phase II testing is complete.

B. The reactor is at equilibrium conditions at approximately 50 percent power.

14.2.12.2.27.3 Test Methods

A. Observe, measure and record turbine-generator casing expansion, axial clearances, rotor position and eccentricity, vibration, and bearing temperatures.

B. After shutdown visually inspect for wear.

14.2.12.2.27.4 Acceptance Criteria. Turbine generator operates within the design specifications.

14.2.12.2.28 Initial Synchronization and 30 Percent Power Test Sequence

14.2.12.2.28.1 Objective. To define the sequence of operations which constitutes the initial sychronization and 30 percent power testing program.

1 14.2.12.2.28.2 Plant Conditions and Prerequisites

A. The requirements for escalation to 30 percent power have been met, the plant is ready for startup, and the system is ready to accept electrical loads up to 30 percent equivalent rated thermal power.

B. Specified test equipment and input signals are available. Equipment has been checked out and is operational.

14.2.12.2.28.3 Test Method. Gradually increase reactor power to approximately 30 percent, taking flow and temperature measurements, radiation surveys and synchronizing the turbine at specified stepping points. Obtain calorimetric, steam and feed-water flow, temperature and nuclear instrumentation data. Check out the operation of automatic control systems. Measure the power distribution in specified normal and abnormal control rod configurations. Load swing and power coefficient tests are then performed.

14.2.12.2.28.4 Acceptance Criteria. Acceptance criteria for each test are included as part of each individual test procedure. Specific acceptance criteria for nuclear tests are provided in an appendix supplied with the sequence document (5S-E-XX-02). 2

14.2.12.2.29 Automatic Steam Generator Level Control Verification at Power 2

14.2.12.2.29.1 Objectives

A. Verify proper level control stability of the steam generator feedwater bypass valve in automatic control at zero power. 1

B. Verify proper stability of the steam generator level control system when transferring control from the feedwater flow bypass valves to the main feedwater valves.

C. Verify proper response of the automatic steam generator level control system during plant transients at various power levels.

D. Verify proper automatic programming of steam generator level during power escalation.

E. Verify proper operation of the turbine-driven feedwater pump speed control during power escalation.

14.2.12.2.29.2 Plant Conditions and Prerequisites

A. Required Phase I and Phase II testing is completed.

B. The reactor is critical and the RCS temperature and pressure conditions are approximately 291.67C (557F) and 157.14 kg/cm^2 (2235 psig), respectively.

C. The turbine generator is on steam slow roll.

D. The steam dump system has been tested and is operational.

14.2.12.2.29.3 Test Method. Record traces of the parameters used for steam generator level control during power escalation and during manually initiated transients at various power levels.

14.2.12.2.29.4 Acceptance Criteria.

1 A. The steam generator water level control system shall maintain water level within the programmed band as indicated in the approved test procedure.

B. The steam generator water level control system shall return water level to the programmed band following the manually induced transients with minimum oscillations and overshoot as described in the approved test procedure.

C. Turbine driven feedwater pump control shall maintain feedwater pump discharge pressure oscillations at a minimum following steam flow changes.

2 14.2.12.2.30 Feedwater Pump Speed Control Tests

14.2.12.2.30.1 Objective. Verify proper operation of the feedwater pump speed control system.

14.2.12.2.30.2 Plant Conditions and Prerequisites

A. The feedwater pump speed control system has been installed, checked out, and calibrated.

B. The reactor is critical at 30 percent nominal power.

C. The main feedwater pumps are operational.

14.2.12.2.30.3 Test Method. Demonstrate proper response of the feedwater pump speed control system to various transients.

14.2.12.2.30.4 Acceptance Criteria. The feedwater pump speed control system regulates feedwater pump speed as specified in the approved test procedure without excessive oscillation or excessive overshoot during transients.

14.2.12.2.31 Automatic Reactor Controls Test 2

14.2.12.2.31.1 Objective. To verify the performance of the reactor control system in maintaining reactor coolant average temperature within acceptable steady-state limits.

14.2.12.2.31.2 Plant Conditions and Prerequisites

A. The reactor is at equilibrium conditions at approximately 30 percent power level.

B. The reactor rod control system is in manual with the controlling rod bank positioned within the maneuvering band and all other control rods fully withdrawn.

C. The following control systems have been checked and placed in automatic control:

1. Pressurizer Level Control System
2. Pressurizer Pressure Control System 1
3. Steam Dump Control System (T_{avg} Mode)
4. Steam Generator Level Control System
5. Feedwater Pump Speed Control System

14.2.12.2.31.3 Test Method. Record traces of the parameters used for reactor control during manually induced T_{avg} deviations and observe system response.

14.2.12.2.31.4 Acceptance Criteria.

A. Manual intervention should not be required to bring plant conditions to equilibrium values following initiation of manually induced T_{avg} deviations.

B. The automatic reactor control system shall return T_{avg} to the band specified in the approved test procedure following the manually induced transients with minimum oscillations and overshoot.

14.2.12.2.32 Rod Cluster Control Assembly Pseudo-Rod Ejection
2 Test

14.2.12.2.32.1 Objective. Verify the rod worth and hot channel factors assumed in the safety analysis.

14.2.12.2.32.2 Plant Conditions and Prerequisites

A. The reactor is at equilibrium conditions at a power level of approximately 30 percent.

B. All of the excore instrumentation channels are operable.

C. The incore detectors and thermocouples are operable.

14.2.12.2.32.3 Test Method

A. Single rod motion is accomplished by disconnecting the lift coils of all rods in the affected bank, except the coil on the selected rod.

B. The selected rod is withdrawn from the core while power and reactor coolant temperature are held constant by boron concentration changes.

C. Data is gathered using the incore detectors, thermocouples, and boron concentration measurements.

14.2.12.2.32.4 Acceptance Criteria. The measured worth of the pseudo-ejected rod and the associated hot channel factors are more conservative than those assumed in the safety analysis.

14.2.12.2.33 Power Coefficient and Power Defect Measurement

2

14.2.12.2.33.1 Objective. Determine the differential power coefficient of reactivity and the integral power defect.

14.2.12.2.33.2 Plant Conditions and Prerequisites

A. The reactor is in the hot zero-power condition with rods in the specified maneuvering bank.

B. The instrumentation necessary for collection of data is installed, calibrated, and operable.

14.2.12.2.33.3 Test Method. Reactor power is maintained congruent with turbine load demand by control bank adjustment throughout the range of each load change from the zero-power condition. Reactivity increments due to periodic control bank steps are determined and recorded throughout each load change. At selected power levels, conditions are stabilized and a heat balance obtained to accurately determine core power. Power coefficient and power defect are calculated with data obtained over the range from hot zero-power to hot full-power.

14.2.12.2.33.4 Acceptance Criteria

A. The best estimate of the measured power coefficient as a function of power, derived from experimental data, is equal to or more conservative than that used in the accident analysis.

B. The measured power defect is compatible with design predictions.

14.2.12.2.34 30 Percent Load Swing Test 2

14.2.12.2.34.1 Objective. Verify proper nuclear plant transient response, including automatic control performance when 10 percent step load changes are introduced at the turbine generator.

14.2.12.2.34.2 Plant Conditions and Prerequisites

A. The plant is operating at approximately 30 percent of rated capacity with plant parameters stabilized.

B. Rod control, pressurizer pressure and level control, steam dump control, steam generator level control, and main feedwater pump speed control are in automatic.

C. Test instruments have been installed as necessary to record plant parameters during the transient.

14.2.12.2.34.3 Test Method. Using the digital electro-hydraulic (DEH) controller, reduce plant output as rapidly as possible to achieve a 10 percent load decrease and record plant parameters during the transient. After the plant has stabilized at approximately 20 percent of rated capacity, increase the plant output as rapidly as possible to achieve a 10 percent load increase and record plant parameters during the transient.

14.2.12.2.34.4 Acceptance Criteria. Reactor and turbine must not trip and safety injection must not be initiated. No manual intervention is required to bring plant conditions to steady-state, and plant variables meet the requirements specified in the approved detailed test procedure.

21 14.2.12.2.35 Static Rod Cluster Control Assembly Drop and Rod Cluster Control Assembly Below Bank Position Measurement

14.2.12.2.35.1 Objective. Demonstrate the response of the excore and incore instrumentation to a rod cluster control assembly (RCCA) below the nominal bank position, and determine hot channel factors associated with this misalignment.

14.2.12.2.35.2 Plant Conditions and Prerequisites

A. All power range nuclear instrumentation channels are operable.

B. The moveable incore detectors are operable.

C. Power escalation testing is completed to approximately the 50 percent reactor power level.

14.2.12.2.35.3 Test Method

A. Single rod movement is accomplished by disconnecting the lift coils of all rods in the affected bank except the selected rod.

B. During rod cluster control assembly insertion, power range detector currents, thermocouple maps, and moveable incore detector traces are periodically recorded to demonstrate sensitivity to RCCA misalignment. The power range detector data provides information to relate core quadrant tilt to RCCA position. With the RCCA fully misaligned, moveable detector flux map is obtained to verify resultant core hot channel factors.

14.2.12.2.35.4 Acceptance Criteria

A. The measured maximum hot channel factor resultant from a single RCCA fully misaligned from its bank is within design safety limits.

B. Incore and/or excore instrumentation is demonstrated to detect any significant power maldistribution caused by the misaligned RCCA.

14.2.12.2.36 Rod Drop Test |2

14.2.12.2.36.1 Objective. Demonstrate the operations of the negative rate trip circuitry in detecting the simultaneous insertion of two rod cluster control assemblies.

14.2.12.2.36.2 Plant Conditions and Prerequisites

A. All power range nuclear instrumentation channels are operable.

B. The reactor is at the steady-state power level specified in the procedure.

C. Pertinent parameters to be measured are connected to recording devices.

14.2.12.2.36.3 Test Method

A. Two rods from a common group are simultaneously dropped by removing voltage to both the moveable and stationary gripper coils of the designated rods.

14.2.12.2.36.4 Acceptance Criteria

A. The reactor trips as a result of the negative rate trip.

B. Steam generator and pressurizer safety valves do not lift.

C. Safety injection is not initiated.

14.2.12.2.37 Shutdown From Outside the Control Room |2

14.2.12.2.37.1 Objective. Demonstrate that the plant may be taken off the line from power operations and maintained in hot shutdown from outside the control room.

14.2.12.2.37.2 Plant Conditions and Prerequisites

A. The plant is at some power level greater than or equal to 10% output on the generator.

B. Two shifts of operators are onsite, one observes from control room, the other performs the test.

14.2.12.2.37.3 Test Method

A. The plant is tripped off the line from outside the control room.

B. Using switchgear, manual operator on valves, local indicators and local panels of controls and indicators, hot shutdown is maintained through the assistance of the plant communication system.

14.2.12.2.37.4 Acceptance Criteria. Hot shutdown is maintained by the members of one shift from outside the control room.

2 14.2.12.2.38 Loss of Offsite Power

14.2.12.2.38.1 Objective. Verify the ability of the plant to sustain an isolation of the offsite power distribution system, and to subsequently act as the onsite power source.

14.2.12.2.38.2 Plant Conditions and Prerequisites

A. The plant is at a steady-state condition with greater than 10 percent generator output.

B. Various control and safety devices are operable and functioning properly.

C. Parameters to be measured are connected to recording devices.

14.2.12.2.38.3 Test Method. Manually initiate a loss of offsite power and record data.

14.2.12.2.38.4 Acceptance Criteria. The emergency diesel generators respond as required per the approved detailed test procedure, and the main generator maintains power to the non-Class 1E service busses.

14.2.12.2.39 Steam Generator Moisture Carryover Test |2

14.2.12.2.39.1 Objective. Verify that the moisture separator equipment in each steam generators meets design requirements.

14.2.12.2.39.2 Plant Conditions and Prerequisites

A. Sufficient quantity of the radioactive tracer is available.

B. Steam generator water level is at the upper limit of the normal operating range.

C. The plant is at a steady-state condition with greater than 75 percent output.

14.2.12.2.39.3 Test Method. Add the short-lived radioactive tracer to the steam generator at approximately 100 percent power; then sample the steam generators and feedwater system, and calculate steam generator moisture carryover.

14.2.12.2.39.4 Acceptance Criteria. Steam generator moisture carryover does not exceed the design limit.

14.2.12.2.40 Main and Reheat Steam System Functional Test |2

14.2.12.2.40.1 Objectives

A. Demonstrate that the main steam and reheat steam systems are operative.

B. Verify the heat transfer characteristics of the steam generator and the reheaters.

14.2.12.2.40.2 Plant Conditions and Prerequisites

A. Required Phase I and Phase II testing is complete.

B. The reactor is at equilibrium conditions at approximately 50 percent power.

14.2.12.2.40.3 Test Methods

A. Exercise the valves and controllers associated with the system to verify function performance.

B. Verify the heat transfer capacity of the steam generators.

C. Verify the heat transfer capacity of the reheaters.

14.2.12.2.40.4 Acceptance Criteria

A. Main steam and reheat steam systems operate in accordance with design functional criteria.

B. Steam generator and reheater heat transfer characteristics are in accordance with the design specifications.

14.2.12.2.41 Incore/Excore Calibration and Axial Flux Difference (AFD) Instrument Calibration

2 14.2.12.2.41.1 Objectives

A. Verify that response of the excore power range detectors is linear with respect to incore axial power distribution. distribution.

B. To calibrate the excore power range detector input, F(Δq), to the ΔT reactor trip setpoint calculator.

1 C. To calibrate the excore power range detector signals to the axial flux difference, Δq, meters, flux recorders and plant process computer.

14.2.12.2.41.2 Plant Conditions and Prerequisites

A. NIS power range isolation amplifiers for each channel have been aligned as described in the NIS Technical Manual.

B. Test data are available from at least three movable detector flux maps obtained over a range of incore axial offsets of at least 15 percent. (These will have been obtained during the Test Sequence at
2 75 Percent Power) (5S-E-XX-18)

14.2.12.2.41.3 Test Method

A. From the data obtained during the test sequence at 75 percent power, take the measured core thermal power, core average incore axial offset (Incore AO), and the top and bottom detector currents, I_{TOP} and I_{BOT}, from each excore power range channel. Compute the corresponding values of incore axial flux difference (Incore Δq), excore axial offset (Excore AO), and normalized top and bottom excore detector currents. Plot Incore AO vs. Excore AO and examine the plot for any departure from linearity.

B. Construct a plot of I^N_{TOP} and I^N_{BOT} vs. Incore Δq. Through the methods described in the procedure, compute the Δq calibration breakpoints and compute the ΔT trip setpoints from Δq values using the Plant Precaution, Limitation and Setpoint (PL&S) Document.

C. Calibrate the AFD instrumentation for each NIS power range channel by computing the calibration points for the Δq values, and via the methods described within the procedure, ensure that the recorded output of the process computer as a function of input Δq is consistent with the calculated expected values. 1

14.2.12.2.41.4 Acceptance Criteria

A. The Excore Axial Offset (AO) from each NIS power range channel is linear with respect to Incore AO.

B. The NIS power range channels have been calibrated to the performance standards of the Westinghouse NIS Technical Manual.

C. The measured output of each NIS power range channel as a function of input Δq, is consistent with the expected output.

D. The measured output of the ΔT reactor trip reset, as a function of input Δq, is consistent with the requirements set forth in the PL&S Document.

E. The recorded output of the process computer as a function of input Δq, is consistent with the calculated expected output.

2 14.2.12.2.42 75 Percent Load Swing Test

14.2.12.2.42.1 Objective. Verify proper nuclear plant transient response, including automatic control performance when 10 percent load changes are introduced at the turbine generator.

14.2.12.2.42.2 Plant Conditions and Prerequisites

A. The plant is operating at approximately 75 percent of rated capacity with plant parameters stabilized.

B. Rod control, pressurizer pressure and level control, steam dump control, steam generator level control, and main feedwater pump speed control are in automatic.

C. Test instruments have been installed as necessary to record plant parameters during the transient.

14.2.12.2.42.3 Test Method. Using the digital electro-hydraulic (DEH) controller, reduce plant output as rapidly as possible to achieve a 10 percent load decrease and record plant parameters during the transient. After the plant has stabilized at approximately 65 percent of rated capacity, increase the plant output as rapidly as possible to achieve a 10 percent load increase and record plant parameters during the transient.

14.2.12.2.42.4 Acceptance Criteria. Reactor and turbine must not trip and safety injection must not be initiated. No manual intervention is required to bring plant conditions to steady-state. Plant variables meet the requirements specified in the approved detailed test procedure.

14.2.12.2.43 Large Load Reduction Test at 75 Percent Power

2

14.2.12.2.43.1 Objective. Verify the ability of the primary plant, secondary plant, and the automatic reactor control systems to sustain a 50 percent step-load reduction from 75 percent of full power.

14.2.12.2.43.2 Plant Conditions and Prerequisites

A. The plant is operating at approximately 75 percent of rated capacity with plant parameters stabilized.

B. Temporary recorders have been installed to monitor various plant parameters.

C. Various control and safety devices are operable and functioning properly.

14.2.12.2.43.3 Test Method. Using the DEH controller reduce the plant output as rapidly as possible to achieve a 50 percent load decrease to 25 percent of rated capacity, and record various plant parameters.

14.2.12.2.43.4 Acceptance Criteria. Reactor and turbine do not trip and safety injection is not initiated. No manual intervention is required to bring plant conditions to steady-state, and plant variables meet the requirements specified in the approved detailed test procedure.

14.2.12.2.44 100 Percent Power Load Swing Test |2

14.2.12.2.44.1 Objective. Verify proper nuclear plant transient response, including automatic control performance when 10 percent step load changes are introduced at the turbine generator.

14.2.12.2.44.2 Plant Conditions and Prerequisites

A. The plant is operating at approximately 100 percent of rated capacity with plant parameters stabilized.

B. Rod control, pressurizer pressure and level control, steam dump control, steam generator level control, and main feedwater pump speed control are in automatic.

C. Test instruments have been installed as necessary to record plant parameters during the transient.

14.2.12.2.44.3 Test Method. Using the digital electro-hydraulic (DEH) controller, reduce plant output as rapidly as possible to achieve a 10 percent load decrease and record plant parameters during the transient. After the plant has stabilized at approximately 90 percent of rated capacity, increase the plant output as rapidly as possible to achieve a 10 percent load increase, and record plant parameters during the transient.

14.2.12.2.44.4 Acceptance Criteria. Reactor and turbine must not trip and safety injection must not be initiated. No manual intervention is required to bring plant conditions to steady-state, and plant variables meet the requirements specified in the approved detailed test procedure.

2 14.2.12.2.45 Large Load Reduction Test at 100 Percent Power

14.2.12.2.45.1 Objective. Verify the ability of the primary plant, secondary plant, and the automatic reactor control systems to sustain a 50 percent step-load reduction from 100 percent of full power.

14.2.12.2.45.2 Plant Conditions and Prerequisites

A. The plant is operating at approximately 100 percent of rated capacity with plant parameters stabilized.

B. Temporary recorders have been installed to monitor various plant parameters.

C. Various control and safety devices are operable and functioning properly.

14.2.12.2.45.3 Test Method. Using the digital electro-hydraulic (DEH) controller, reduce the plant output as rapidly as possible to achieve a 100 percent load decrease to 50 percent of rated capacity, and record various plant parameters.

14.2.12.2.45.4 Acceptance Criteria. Reactor and turbine do not trip and safety injection is not initiated. No manual intervention is required to bring plant conditions to steady-state, and plant variables meet the requirements specified in the approved detailed test procedure.

2 14.2.12.2.46 Plant Trip from 100 Percent Power

14.2.12.2.46.1 Objective. Verify the ability of the primary and secondary plant and automatic control systems to sustain a trip from 100 percent power, and to bring the plant to stable conditions following the transient. 462

14.2.12.2.46.2 Plant Conditions and Prerequisites

A. The plant is operating at approximately 100 percent power with the plant parameters stabilized.

B. Temporary recorders have been installed to monitor various plant parameters.

C. Various control and safety devices are operable and functioning properly.

14.2.12.2.46.3 Test Method. Notify the load dispatcher and initiate a plant trip by manually tripping the turbine, and record various plant parameters.

14.2.12.2.46.4 Acceptance Criteria

A. Reactor and turbine trip and safety injection is not initiated. 9

B. Manual intervention is not required to bring plant condition to steady-state and plant variables meet the requirements specified in the approved detailed test procedure.

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14.2.12.2.48 Nuclear Steam Supply System Acceptance Test

14.2.12.2.48.1 Objectives

A. Demonstrate the reliability of the nuclear steam supply system (NSSS) by maintaining the plant at rated output (+0 percent, -5 percent) for 100 hours without a load reduction or plant trip resulting from an NSSS malfunction.

B. Measure the NSSS output and compare it with its warranted rating.

14.2.12.2.48.2 Plant Conditions and Prerequisites

A. Various control systems are in the automatic mode and functioning properly.

B. The reactor is operating at approximately 100 percent power with plant parameters stabilized.

C. Temporary recorders and instrumentation have been installed as required.

14.2.12.2.48.3 Test Method. Load the turbine generator until the NSSS is at its rated output (+0, -5 percent) as determined by a secondary calorimetric, and then start the 100-hour run. After approximately fifty hours, record data for a 2 to 4-hour period to determine NSSS output.

14.2.12.2.48.4 Acceptance Criteria

A. The reliability of the NSSS has been demonstrated by operating the plant at 95 percent to 100 percent of rated thermal output, or a lesser power level as mutually agreed to by Westinghouse and KHNP , for 100 hours without a load reduction or plant trip resulting from an NSSS malfunction. 554

B. The NSSS is capable of developing warranted output.

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2016.07.22

14.2.12.2.49 Nuclear Instrumentation System Setpoint Adjustments and Power Range Calibrations 2

14.2.12.2.49.1 Objectives

A. Adjust the power range high flux trip setpoint before each escalation to 30%, 50%, 75%, 90% and 100%.

B. Adjust the gain of each power range channel at each new power level.

14.2.12.2.49.2 Plant Conditions and Prerequisites

A. The incore instrumentation system is operable.

B. Plant conditions are steady-state while performing calorimetrics at the various power levels.

14.2.12.2.49.3 Test Method

A. Before each escalation to a new power level, reset the power range high flux trip setpoint to a value not greater than 20 percent above the new power level (to a maximum of 109 percent).

B. At each new power level, perform a calorimetric and incore flux map, and then adjust the gain of the power range channels based on this data.

14.2.12.2.49.4 Acceptance Criteria

A. The power range high flux trip setpoints are adjustable per the approved detailed test procedure.

B. The power range channels are adjustable to agree with calorimetric and incore flux map data.

14.2.12.2.50 Thermal Power Measurement and Statepoint Data Collection 2

14.2.12.2.50.1 Objectives

A. Determine reactor thermal power at various power levels.

B. Identify the control and protection instrumentation calibration data to be obtained at steady-state power levels (state points) during the power ascension test program at each power level.

14.2.12.2.50.2 Plant Conditions and Prerequisites

A. Various control systems are in the automatic mode and functioning properly.

B. Temporary instrumentation has been installed as required.

14.2.12.2.50.3 Test Method. Record various plant parameters at 5- to 10-minute intervals, average this data, and then compute reactor thermal power at the various power levels specified.

14.2.12.2.50.4 Acceptance Criteria. Reactor thermal power meets the requirements of the detailed test procedure at each specified power level.

2 14.2.12.2.51 Radiation Surveys

14.2.12.2.51.1 Objective. Measure radiation dose levels at various power levels at preselected points throughout the plant to verify shielding effectiveness.

14.2.12.2.51.2 Plant Conditions and Prerequisites

A. Radiation survey instruments to be used are calibrated against known sources.

B. The reactor is critical at a steady-state power level.

14.2.12.2.51.3 Test Method. In accordance with procedures for radiation surveys, dose levels at various power levels are measured at points throughout the station.

14.2.12.2.51.4 Acceptance Criteria. Measured radiation levels are within the specified limits for each area surveyed.

14.2.12.2.52 Adjustment to the Reactor Control System 2

14.2.12.2.52.1 Objectives

A. Determine the average temperature program resulting in the highest possible secondary-side steam pressure without exceeding pressure limitations for the turbine or maximum allowable average temperature.

B. Obtain primary system temperature data for making signal adjustments to the reactor control system.

14.2.12.2.52.2 Plant Conditions and Prerequisites

A. Various control systems are in the automatic mode and functioning properly.

B. Plant conditions are steady-state when recording data at each power level.

14.2.12.2.52.3 Test Method. Record temperatures, pressures, and flows at various power levels. Plot the data obtained at lower power levels and extrapolate values for the 100 percent power level. Revise the reactor control system average temperature program in order to achieve design steam generator pressure for the various power levels.

14.2.12.2.52.4 Acceptance Criteria

A. Full load steam generator pressure shall meet the requirements specified in the approved detailed test procedure.

B. Full load average temperature shall not exceed the design average temperature.

14.2.12.2.53 Calibration of Steam and Feedwater Flow Instrumentation 2

14.2.12.2.53.1 Objective. Calibrate the steam flow transmitters against feedwater flow at various power levels.

14.2.12.2.53.2 Plant Conditions and Prerequisites

A. The reactor plant is at steady state conditions.

B. The feedwater flow transmitters and steam flow transmitters have been calibrated.

C. The special test differential pressure meters have been installed in the feedwater system for measuring feedwater flow.

14.2.12.2.53.3 Test Method. Determine feedwater flow using the special test equipment at steady-state conditions at the various power levels specified in the procedure, and compare this to feedwater flow and steam flow transmitter readings. Adjust the calibration of these transmitters as necessary.

14.2.12.2.53.4 Acceptance Criteria. The feedwater flow and steam flow transmitters are capable of being adjusted to agree with special test instrument data.

14.2.12.2.54 Operational Alignment of Process Temperature Instrumentation and Setpoint Adjustment

2| 14.2.12.2.54.1 Objective. To align ΔT and T_{avg} process instrumentation under isothermal conditions, prior to criticality and at power.

14.2.12.2.54.2 Plant Conditions and Prerequisites

A. This alignment will be performed prior to initial criticality and again at 75 percent power. Alignment will be checked at 100-percent power.

B. All reactor coolant pumps shall be operating.

14.2.12.2.54.3 Test Method

A. Align ΔT and T_{avg} in accordance with test instructions under isothermal conditions prior to criticality and at approximately 75 percent power. Extrapolate the 75 percent power data to determine ΔT and T_{avg} values for the 100 percent power plateau.

B. At or near full power, check the alignment of the ΔT and T_{avg} channels for agreement with the results of thermal power measurement. Realign any channels, as necessary, to meet test specifications.

14.2.12.2.54.4 Acceptance Criteria. The 100 percent power indications for ΔT and T_{avg} channels agree with the design specifications.

14.2.12.2.55 Initial Criticality 2

14.2.12.2.55.1 Objective. To achieve initial criticality in a cautious and controlled manner.

14.2.12.2.55.2 Plant Conditions and Prerequisites

A. A program for sampling and analyzing RCS loop and pressurizer water for boron concentration has been initiated.

B. A plant strip chart recorder is set to record one SR and one IR channel. 1

C. Each SR channel has a count rate of at least 2 cps and an audible and visual count rate is being received from the audible count rate channel and scaler timer units of one SR channel.

D. All three RCPs are in operation.

E. All further conditions specified in 5S-E-XX-03 are satisfied. 2

14.2.12.2.55.3 Test Method. Initial criticality is achieved through RCC bank withdrawal followed by RCS boron dilution until the reactor is stabilized at a flux level of approximately 1×10^{-8} amps on the IR channels. Approach to criticality is followed by ICRR monitoring as described in procedure 5S-SC-06. 1

14.2.12.2.55.4 Acceptance Criteria. The reactor is critical with the flux level established at approximately 1×10^{-8} amps on intermediate range channels, N-35 and N-36.

14.2.12.2.56 Boron Endpoint Determination.

14.2.12.2.56.1 Objective. Determine the endpoint RCS boron concentration in the all-rods-out operating condition.

14.2.12.2.56.2 Plant Conditions and Prerequisites

A. The reactor is critical with neutron flux level within the range for zero-power physics test.

B. The RCS is at normal operating pressure and temperature.

C. Periodic sampling of the RCS loop and the pressurizer for boron concentration is being performed.

14.2.12.2.56.3 Test Method. Withdraw the controlling rod cluster control (RCC) bank continuously until it is fully withdrawn, allow neutron flux level to increase, and then insert the controlling RCC bank and reestablish the initial flux level. Record reactivity, RCS temperature, and calculate the endpoint boron concentration, using this information in conjunction with RCS boron concentration data.

14.2.12.2.56.4 Acceptance Criteria. Boron endpoint concentration meets the requirements specified in the detailed test procedure.

14.2.12.2.57 Isothermal Temperature Coefficient Measurement

2

14.2.12.2.57.1 Objective. Determine moderator temperature coefficient of reactivity.

14.2.12.2.57.2 Plant Conditions and Prerequisites

A. The reactor is critical with the neutron flux level within the range established for zero-power physics tests.

B. The RCS is at approximately no-load temperature and pressure.

C. Reactor coolant system temperature, neutron flux, boron concentration, and reactivity are stable.

14.2.12.2.57.3 Test Method. The isothermal temperature coefficient is obtained by dynamically measuring the reactivity change due to a temperature change in the primary system, moderator temperature coefficient is derived from isothermal measurement by correcting for Doppler coefficient.

14.2.12.2.57.4 Acceptance Criteria. The moderator temperature coefficient meets the requirements specified in the detailed test procedure.

14.2.12.2.58 Core Flux Map With All Rods Out |2

14.2.12.2.58.1 Objective. Obtain and analyze core power distribution for the all-rods-out configuration.

14.2.12.2.58.2 Plant Conditions and Prerequisites

A. The reactor is critical at a steady-state power level within the range for zero-power physics tests.

B. Incore moveable detector system checkout is complete and the system is operable.

C. The computer systems are operable as necessary for incore flux map data processing.

14.2.12.2.58.3 Test Method. Perform an incore flux map for the all-rods-out configuration.

14.2.12.2.58.4 Acceptance Criteria. Core peaking factors are within acceptable limits per the approved detailed test procedure.

14.2.12.2.59 Rod Worth Measurement Test |2

14.2.12.2.59.1 Objective. Determine integral and differential worths for sequenced control banks.

14.2.12.2.59.2 Plant Conditions and Prerequisites

A. The reactor power level is in the zero-power testing range with the reactor critical.

B. The RCS is at normal operating pressure and temperature.

14.2.12.2.59.3 Test Method. Sequenced bank differential rod worth is determined by either borating the RCS while withdrawing the control banks, or by diluting the reactor system while inserting the control banks to maintain nominal system criticality. Integral worth is then determined from the differential reactivity data.

14.2.12.2.59.4 Acceptance Criteria. Differential and integral worths for the sequenced control banks meet the requirements detailed in the approved test procedure.

2 14.2.12.2.60 Rod Cluster Control Assembly Pseudo-Ejection at Zero Power

14.2.12.2.60.1 Objective. Verify the rod worth and hot channel factors assumed in the safety analysis.

14.2.12.2.60.2 Plant Conditions and Prerequisites

A. Reactor power level is in the zero-power testing range with the reactor critical.

B. The RCS is at normal operating pressure and temperature.

C. The incore detectors and thermocouples are operable.

14.2.12.2.60.3 Test Method. Ejected rod cluster control assembly (RCCA) worth at zero-power is determined by obtaining a critical configuration with the sequenced banks at their insertion limit as defined in the technical specifications. The most reactive inserted rod is withdrawn to maintain nominal criticality during boration. The reactivity addition is determined by summing the differential reactivity insertions as the rod is withdrawn to its withdrawal limit.

14.2.12.2.60.4 Acceptance Criteria. The worth of an ejected RCCA at zero-power is less than or equal to the value specified in the approved detailed test procedure.

2 14.2.12.2.61 Natural Circulation Test

14.2.12.2.61.1 Objective. Verify proper reactor operation in the natural circulation mode.

14.2.12.2.61.2 Plant Conditions and Prerequisites

A. Reactor power is at approximately 3 percent.

B. All reactor coolant pumps are running.

C. Temporary recorders are available as required to monitor transient response.

14.2.12.2.61.3 Test Method. Trip all RCPs and demonstrate the establishment of natural circulation in the RCS.

14.2.12.2.61.4 Acceptance Criteria. Natural circulation is established in the RCS per the requirements of the detailed test procedure.

14.2.12.2.62 Startup Test Program Sequence Document 2

14.2.12.2.62.1 Objective. Provide a recommended schedule and sequence of the operations for the initial startup testing program from initial core loading through the plant acceptance test.

14.2.12.2.62.2 Plant Conditions and Prerequisites

A. All plant components and systems are fully assembled and operational and all preoperational tests have been satisfactorily completed.

B. Preliminary control and protection setpoints and limits have been established.

C. Adequate supplies of demineralized water and boric acid are available. 1

14.2.12.2.62.3 Test Method. Perform the sequence of tests which comprise the initial startup program.

14.2.12.2.62.4 Acceptance Criteria. These are provided as part of each individual test. Specific acceptance criteria for nuclear tests are provided in an appendix supplied with this procedure.

14.2.12.2.63 ICRR Monitoring for Core Loading 2

14.2.12.2.63.1 Objectives

A. To describe the methods for obtaining nuclear monitoring data during initial core loading. 1

B. To describe the sequence, frequency, and core conditions for obtaining nuclear monitoring data.

14.2.12.2.63.2 Plant Conditions and Prerequisites

A. All electronic equipment associated with the nuclear monitoring channels (TCLIS and NIS source ranges) has been installed, checked out, and is operational.

B. The fuel transfer system is aligned and ready for operation.

C. The RCS, CVCS, RHRS, and SIS are aligned for initial fuel loading with letdown through the RHRS to the CVCS maintaining water quality.

D. Fuel has been inspected and is available for core loading.

1 E. A communications system has been installed and is in service between the control room, the spent fuel pit, and the containment.

14.2.12.2.63.3 Test Methods. Counting with the TCLIS (three channels) and the plant NIS source range ranges, compute the average integral counts from three (3) separate count measurements, the background corrected average integral counts and the inverse count rate ratio (ICRR). Plot the ICRR as a function of core loading step number to watch for an approach to eminent criticality as ICRR approaches 0.

14.2.12.2.63.4 Acceptance Criteria. None applicable.

14.2.12.2.64 Post Core Loading Precritical Test Sequence

2

14.2.12.2.64.1 Objective. To define the sequence of tests to be performed between initial core loading and initial criticality.

14.2.12.2.62.2 Plant Conditions and Prerequisites

1 A. The core is installed and the RCS is at ambient temperature and pressure with the boron concentration equal to or greater than the value required for core loading.

B. Reactor coolant pumps are operable. Instrumentation and control systems required for startup are aligned and operable.

14.2.12.2.64.3 Test Method

A. At ambient temperature, install the remaining equipment and instrumentation associated with the core and reactor vessel. Verify the proper operation of the digital rod position indicator and rod control systems.

B. Heat up to hot no-load temperature and perform the specified tests of the RCS and associated systems, rod control and DRPI systems, and incore movable detectors. 1

14.2.12.2.64.4 Acceptance Criteria. Relevant acceptance criteria are provided with each of the individual test procedures.

14.2.12.2.65 Initial Criticality and Low Power Test Sequence 2

14.2.12.2.65.1 Objective. To define the sequence of operations and tests, beginning with initial criticality, which constitutes the low power testing program.

14.2.12.2.65.2 Plant Conditions and Prerequisites

A. All tests required by the post core loading test sequence have been satisfactorily completed.

B. All full length RCC banks are fully inserted and the reactor coolant pumps are operating with RCS pressure at 157 ± 1.8 bar, temperature at $291.6^{+0}_{-2.8}$ °C, and boron concentration is consistent with shutdown margin requirements. 1

C. All inputs and equipment required for monitoring and measuring reactivity are available and operable.

14.2.12.2.65.3 Test Method. Acquire computer trend data and perform RCS boron sampling at regular intervals, achieve initial criticality; obtain boron endpoints, isothermal temperature coefficients, control rod worths, and power distribution measurements for specified normal and abnormal control rod configurations. Overlap between NIS source range, intermediate range, and power range detectors is established.

14.2.12.2.65.4 Acceptance Criteria. Test results acceptance criteria for each of the low power tests are supplied in the
2 sequence document (5S-E-XX-02).

14.2.12.2.66 ICRR Monitoring for Approach to Initial
2 Criticality

14.2.12.2.66.1 Objectives

A. To describe the methods for obtaining data used for monitoring core reactivity during the approach to initial criticality.

B. To describe the sequence, frequency, and core conditions for obtaining nuclear monitoring data.

C. To describe the methods for evaluating nuclear monitoring data during the approach to initial criticality.

14.2.12.2.66.2 Plant Conditions and Prerequisites

A. Both SR and IR nuclear channels have been checked
1 out and are operational, and the systems have been energized for a minimum of four hours to permit stable operation.

B. The plant is ready for approach to criticality as specified
2 in the initial criticality (5S-E-XX-03) procedure.

14.2.12.2.66.3 Test Method. Utilizing the plant source range (SR) and intermediate range (IR) channels, determine the inverse count rate ratio (ICRR) after each increment of RCC bank withdrawal. By plotting the ICRR data points and extrapolating, determine the expected critical bank position and ensure that it indicates criticality will be achieved at a bank position greater than the next programmed bank configuration, since criticality is not expected during RCC withdrawal. During the boron dilution phase, compute the ICRR similarly as above and plot the ICRR for each counting channel as a function of time, reactor makeup water addition, and RCS boron concentration. Extrapolating the ICRR data points will determine the expected time, boron concentration, and RCS dilution at which criticality will occur. This process will be repeated until criticality is achieved.

14.2.12.2.66.4 Acceptance Critiera. None applicable.

14.2.12.2.67 Reactivity Computer Checkout 2

14.2.12.2.67.1 Objective. To demonstrate proper operation of the reactivity computer through a dynamic test using neutron flux signals.

14.2.12.2.67.2 Plant Conditions and Prerequisites

A. The reactor is critical with the flux level within the zero power testing range as determined by 5S-C-SC-02. 2

B. RCS temperature and pressure are at the nominal hot no-load values.

C. The controlling rod bank is positioned in accordance with the approved test procedure.

D. The reactivity computer installation checks have been satisfactorily completed in accordance with the instruction manual.

14.2.12.2.67.3 Test Method. Increase reactivity by withdrawal of the controlling rod bank and allow reactivity to stabilize, then measure the reactor period and compare with theoretical reactivity obtained from the nuclear design report. 1

14.2.12.2.67.4 Acceptance Criteria. The average absolute deviation between indicated and theoretical reactivity from the measurements is within the tolerance specified in the approved test procedure.

14.2.12.2.68 Determination of Core Power Range for Physics Testing 2

14.2.12.2.68.1 Objectives

A. Determine the reactor power level (neutron flux level) at which detectable reactivity feedback effects from fuel heating occur.

B. Establish the range of neutron flux level in which zero power reactivity measurements are to be performed.

14.2.12.2.68.2 Plant Conditions and Prerequisites

A. The reactor is critical with flux level at approximately 1×10^{-8} amps on the intermediate range channels.

B. RCS temperature and pressure are at approximately 291.67C (557F) and 157.14 kg/cm^2 (2235 psig), respectively.

C. The reactivity computer has been installed and checked out.

D. The controlling rod bank is at a position specified by the approved test procedure.

14.2.12.2.68.3 Test Method. Increase the neutron flux level by withdrawal of the controlling rod bank until nuclear heating effects are observed. The power level is recorded at this point and the physics testing power range is established between one and two decades below the recorded power.

14.2.12.2.68.4 Acceptance Criteria. The upper and lower limits of core power range for physics testing are determined and recorded in accordance with the approved test procedure.

2 14.2.12.2.69 Incore Movable Detector and Thermocouple Mapping

1 14.2.12.2.69.1 Objective. Obtain necessary flux maps and thermocouple maps for at-power physics tests.

14.2.12.2.69.2 Plant Conditions and Prerequisites

A. The reactor is critical at a steady-state power level within the required ranges for at-power physics testing.

B. Incore movable detector system checkout is complete and the system is operable.

C. Incore thermocouple system checkout is complete and the system is operable.

D. The process computer system is operable as necessary for incore flux map and thermocouple map data processing.

14.2.12.2.69.3 Test Method. Perform an incore flux map and an incore thermocouple map for various steady-state core power levels.

14.2.12.2.69.4 Acceptance Criteria. All flux map and thermocouple data are within acceptable limits per the approved applicable test sequence.

14.2.12.2.70 Test Sequence at 50 Percent Power 2

14.2.12.2.70.1 Objective. To define the sequence of operations during escalation from 30 percent to 50 percent power and the testing program at approximately 50 percent of rated thermal power.

14.2.12.2.70.2 Plant Conditions and Prerequisites

A. The requirements for escalation to 50 percent power have been met, and the reactor is at a stable power level of 30 percent and ready to accept electrical loads up to 50 percent equivalent rated thermal power.

B. Specified signals and equipment are available; the equipment is checked out and operational.

14.2.12.2.70.3 Test Method. Using the turbine controller, gradually increase the power to 50 percent, observing specified stopping points for data acquisition. Perform radiation surveys, obtain calorimetric, steam and feedwater flow, temperature and nuclear instrumentation data as required. Power distributions are measured in specified normal and abnormal control rod configurations. The power coefficient test, preliminary net load trip test, and RCS flow measurement are performed. 1

14.2.12.2.70.4 Acceptance Criteria. Acceptance criteria are included within each individual test procedure. Specific acceptance criteria for nuclear tests are provided in an appendix supplied with the sequence document (5S-E-XX-02). 2

14.2.12.2.71 Test Sequence at 75 Percent Power 2

14.2.12.2.71.1 Objective. To define the sequence of operations during escalation from 50 percent to 75 percent power and the testing program at approximately 75 percent of rated thermal power.

14.2.12.2.71.2 Plant Conditions and Prerequisites

A. The minimum requirements for escalation above 50 percent power have been met and the reactor is at approximately 50 percent power with the Axial Flux Difference (AFD) within the target band. The plant is ready to accept electrical loads up to 75 percent equivalent rated thermal power.

B. Specified inputs and equipment are available. Equipment is checked out and operational.

C. A preliminary calibration of the AFD instrumentation has been performed.

14.2.12.2.71.3 Test Method. Increase power to 75 percent maintaining AFD within the target band. Obtain specified alignment data. The Tavg program, NIS, and AFD calibrations are performed. Power coefficient, load swing and large load reduction tests are also performed. Power distribution is measured in normal and perturbed axial flux distributions.

14.2.12.2.71.4 Acceptance Criteria. Acceptance criteria are included within each individual test procedure. Specific acceptance criteria for nuclear tests are provided in an
2 appendix supplied with the sequence document (5S-E-XX-02).

2 14.2.12.2.72 Test Sequence at 90 Percent Power

14.2.12.2.72.1 Objective. To define the sequence of operations
1 during escalation from 75 percent to 90 percent power and the testing program at approximately 90 percent of rated thermal power.

14.2.12.2.72.2 Plant Conditions and Prerequisites

A. Requirements for escalation above 75 percent have been met; the reactor is at approximately 75 percent with the axial flux difference (AFD) within the target band. The plant is ready to accept electrical loads up to approximately 90 percent equivalent rated thermal power.

B. Specified inputs and equipment are available. Equipment is checked out and operational.

14.2.12.2.72.3 Test Method. Increase the power to 90 percent, maintaining the AFD within the target band. Obtain specified instrumentation alignment data and the power coefficient. Measure normal power distribution.

14.2.12.2.72.4 Acceptance Criteria. Acceptance Criteria are included within each individual test procedure. Specific acceptance critiera for nuclear tests are provided in an
2 appendix supplied with the sequence document (5S-E-XX-02).

Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.1	Main Steam System	5P-A-AB-01	Main Steam System
		5P-B-AB-01	Main Steam System
14.2.12.1.2	Power-Operated Relief Valves	5P-A-AB-02	Steam Gen. Pwr. Operated Relief Valves
		5P-B-AB-03	Main Steam Relief Valves (S/G Pwr. Oper. Relief)
14.2.12.1.3	Main Steam Line Isolation Valve	5P-A-AB-03	Main Steam Isolation Valve
		5P-B-AB-02	Main Steam Isolation Valve
14.2.12.1.4	Main Steam Safety Valves	5P-B-AB-04	Main Steam Valves
14.2.12.1.5	Steam Dump System	5P-A-AB-05	Steam Dump System (Valve)
		5P-B-AB-05	Steam Dump System (Valve)
14.2.12.1.6	Moisture Separator Reheater System	5P-A-AC-05	MSR System
14.2.12.1.7	Main Turbine	5P-A-AC-01	Mian Turbine Protection
		5P-A-AC-09	Main Turbine Tripping
		5P-A-AC-02	Main Turbine Control Gear (Steam Valves)
		5P-A-AC-06	Main Turbine Drain System

Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
		5P-A-AC-07	Electrical Turning Gear
		5P-B-AC-01	TBN-GEN Startup Sequence and Initial TBN-Operation
		5P-A-AC-08	Electric Overspeed
		5P-A-CP-01	Static T/G Turbovisory
14.2.12.1.8	Condensate System	5P-A-AD-01	Condensate System
		5P-A-AD-02	L,P Hood Sprays
		5P-B-AD-02	L,P Hood Sprays
14.2.12.1.9	Mian Feedwater System	5P-A-AE-01	Main Feedwater System
14.2.12.1.10	Heater Drain System	5P-A-AF-01	FW HTR Vent. Drain & Extraction System
		5P-B-AF-01	FW HTR Vent. Drain & Extraction System
14.2.12.1.11	Condensate Demineralizer	5P-A-AK-01	Condensate Demeralizer and Regeneration System
14.2.12.1.12	Demin. Neutralization System	5P-A-AK-02	Demineralizer Neutralization System
14.2.12.1.13	Auxiliary Feedwater System (Motor-Driven Pumps)	5P-B-AL-01	Aux. Feed Water System (Motor)
		5P-A-AL-01	Aux. Feed Water System (Motor)

SPECIFIC INFORMATION TO BE
INCLUDED IN THE FSAR

Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.14	Aux. Feedwater System (Turbine-Driven Pumps)	5P-A-AL-02 5P-B-AL-02	Aux. Feedwater System (Turbine) Aux. Feedwater System (Turbine)
14.2.12.1.15	Raw Water System	5P-A-AM-01	Raw Water System
14.2.12.1.16	Makeup Water Demineralizer Sys.	5P-A-AN-01	Makeup Water Demineralizer System
14.2.12.1.17	Condensate Transfer and Storage System	5P-A-AP-01	Condensate Transfer and Storage System
14.2.12.1.18	Condensate and Feedwater Chemical Control System	5P-A-AQ-01	Condensate and Feedwater Chemical Control System
14.2.12.1.19	Steam Generator Layup Chemistry Control System	5P-A-AQ-02	S/G Layup Chemistry Control System
14.2.12.1.20	Reactor Coolant System Hot Functional Outline	5P-B-XX-01 5P-B-BB-02	Prerequisite List for HFT RCS Heatup
14.2.12.1.21	Pressurizer Relief Tank	5P-A-BB-03	Pressurizer Relief Tank
14.2.12.1.22	Reactor Coolant Pump Standpipe Flow	5P-A-BL-01	Reactor Makeup Water System
14.2.12.1.23	Resistance Temperature Detector Cross-calibration	5P-B-SC-01	Incore Thermocouple and RTD Cross-calibration

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Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.24	Reactor Vessel Head Vent Valves	5P-B-BB-01	Reactor Coolant System
14.2.12.1.25	Resistance Temperature Detector Loop Transport Time	5S-D-BB-04	RTD Bypass Loop Flow Verification 462
14.2.12.1.26	Pressurizer Pressure & Level	5P-B-BB-06	Pressurizer Pressure and Level Control
		5P-B-BB-07	Pressurizer Relief and Safety Valves
14.2.12.1.27	Pressurizer Spray Control Valve	5P-B-BB-06	Pressurizer Pressure and Level Control
		5S-D-BB-01	PZR Spray & HTR capability & Continuous Spray Flow Setting
14.2.12.1.28	Reactor Coolant System Cold Hydro	5P-A-BB-02	Reactor Cold Hydro Test
14.2.12.1.29	Reactor Coolant Pumps Hot Functional Data Sheets	5P-B-BB-02	RCS Heat up
14.2.12.1.30	Reactor Vessel Vibration Inspection	5P-B-BB-01	Reactor Coolant System
		5S-C-BB-01	RCS Post Hot Functional Inspection, Cleaning and Testing

Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.31	Reactor Coolant System Leak Rate Test	5P-B-BB-01	Reactor Coolant System
14.2.12.1.32	Residual Heat Removal Pump Pre-operational Test	5P-B-BC-01 5P-A-BC-01	RHR System RHR System
14.2.12.1.33	Residual Heat Removal Valve Interlock	5P-A-BC-01	RHR System
14.2.12.1.34	Residual Heat Removal Containment Sump Flow	5P-A-BK-03	Containment Sump Vortex Test
14.2.12.1.35	Low Head Safety Injection Flow Verification	5P-A-BH-01	RWST Suction Header Test
14.2.12.1.36	Charging/High Head Safety Injection Pumps Mini-Flow Verification	5P-A-BG-01	CVCS
14.2.12.1.37	Makeup and Blending	5P-A-BG-01	CVCS
14.2.12.1.38	Charging, Letdown, and Seal Injection	5P-A-BG-01 5P-B-BG-01	CVCS CVCS
14.2.12.1.39	Volume Control Tank	5P-A-BG-01	CVCS
14.2.12.1.40	Boric Acid Transfer System	5P-A-BG-02	Boric Acid System

Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.41	Boron Thermal Regeneration System Functional Test	5P-A-BG-03	Boron Thermal Regeneration System & Concentration Mea. System
		5P-A-BG-04	BTRs Chilled Water System
14.2.12.1.42	Boron Thermal Regeneration System Preoperational (Without Resin)	5P-A-BG-02	BTRS
14.2.12.1.43	Boron Thermal Regeneration System Preoperational (With Resin)	5P-B-BG-02	BTRS
14.2.12.1.44	Boron Concentration Measurement System	5P-B-BG-01	CVCS
		5P-B-BG-02	BTRS
14.2.12.1.45	Solid System Pressure Control	5P-B-BB-02	RCS Heat up
14.2.12.1.46	Refueling Water Storage Tank Suction Header Capacity	5P-A-BH-01	RWST Suction Header Test
14.2.12.1.47	Safety Injection Containment Sump Valves Auto Switchover	5P-A-BH-02	SI Containment Sump Valves Auto Switchover
14.2.12.1.48	Charging/High Head Safety Injection Pump Curve	5P-A-BH-03	SI/Charging Pump Curve Test/HHSI Flow Balance and Recirc Test

SPECIFIC INFORMATION TO BE
INCLUDED IN THE FSAR

Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.49	High Head Safety Injection Flow Balance	5P-A-BH-03	SI/Charging Pump Curve Test/HHSI Flow Balance and Recirc Test
14.2.12.1.50	High Head Safety Injection Recirculation Mode Flow Verification	5P-A-BH-03	SI/Charging Pump Curve Test/HHSI Flow Balance and Recirc Test
14.2.12.1.51	Boron Injection Recirculation System	5P-A-BH-04	Boron Injection Recirculation System Cold
		5P-B-BH-02	Boron Injection Recirculation System Hot
14.2.12.1.52	Accumulator Blowdown	5P-A-BH-05	SI Accumulator Test
14.2.12.1.53	Accumulator Discharge Valve	5P-A-BH-05	SI Accumulator Test
14.2.12.1.54	Accumulator Level	5P-A-BH-05	SI Accumulator Test
14.2.12.1.55	Safety Injection Hot Preoperational	5P-B-BH-01	Safety Injection System
14.2.12.1.56	Boron Injection Recirculation Preoperational	5P-B-BH-02	Boron Injection Recirculation System Hot
14.2.12.1.57	Safety Injection Check Valves	5P-B-BH-01	Safety Injection System

Table 14.2-1

Preoperational Test Procedures
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Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.58	Containment Spray System Nozzle Air Test	5P-A-BK-01	Containment Spary Nozzle Air Test
14.2.12.1.59	Containment Spray System	5P-A-BK-02	Containment Spray System
14.2.12.1.60	Reactor Makeup Water System	5P-A-BL-01	RX Makeup Water System
		5P-A-AN-01	Makeup Water Demineralizer System
14.2.12.1.61	Steam Generator Blowdown System	5P-A-BM-01	S/G Blowdown System
		5P-B-BM-01	S/G Blowdown System
14.2.12.1.62	Mian Turbine Steam Seals System	5P-A-CA-01	Mian TBN Gland Seal System
		5P-B-CA-01	Main TBN Gland Seal System
14.2.12.1.63	Main Turbine and Generator Lube Oil System	5P-A-CB-01	Main TBN Lube Oil System
		5P-A-CB-02	Main TBN Lube Oil System
		5P-B-CB-01	Main TBN Lube Oil System
14.2.12.1.64	Generator Hydrogen & Carbon Dioxide System	5P-A-CC-01	Gen. H_2 & CO_2 Sys.
		5P-B-CC-01	Gen. H_2 & CO_2 Sys.
14.2.12.1.65	Generator Hydrogen Seal Oil System	5P-A-CD-01	Gen. Seal Oil Sys.
		5P-A-CD-01	Gen. Seal Oil Sys.

SPECIFIC INFORMAITON TO BE
INCLUDED IN THE FSAR

Table 14.2-1

Preoperational Test Procedures
(Sheet 9 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.66	Generator Stator Cooling System	5P-A-CE-01	Gen. Stator Cooling Water System
		5P-B-CE-01	Gen. Stator Cooling Water System
14.2.12.1.67	Lube Oil Storage & Purification System	5P-A-CF-01	Lube Oil Storage & Purification System
14.2.12.1.68	Condenser Air Removal System	5P-A-CG-01	Condenser Air Removal System
		5P-B-CG-01	Condenser Air Removal System
		5P-A-CG-02	Cold Vacuum
14.2.12.1.69	Main Turbine Control Oil System	5P-A-CH-01	Mian TBN Control Oil System
		5P-B-CH-01	Mian TBN Control Oil System
14.2.12.1.70	Mian Turbine Governor Control System	5P-A-AC-03	Mian TBN Governor ARU
14.2.12.1.71	Mian Feed Pump Turbine Lube Oil System	5P-A-CJ-01	Mian Feed Pump TBN Lube Oil Sys.
		5P-B-CJ-01	Main Feed Pump TBN Lube Oil Sys.
14.2.12.1.72	Circulating Water System	5P-A-DA-01	Circulating Water System
14.2.12.1.73	Amertap Condenser Tube Cleaning Sys.	5P-A-DA-02	Amertap System
14.2.12.1.74	Circulating Water Screens & Water Pumps	5P-A-DC-01	Circulating Water Screens & Screen Wash Pumps

Table 14.2-1

Preoperational Test Procedures
(Sheet 10 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.75	Circulating Water Chemical Injection	5P-A-DD-01	Circulating Water Chemical Injection System
14.2.12.1.76	Turbine Plant Open Cooling Water Sys.	5P-A-EA-01	TBN Plant Open Cooling Water Sys.
14.2.12.1.77	Turbine Plant Closed Cooling Water System	5P-A-EB-01	TBN Plant Closed Cooling Water Sys.
14.2.12.1.78	Fuel Pool Cooling & Cleanup	5P-A-EC-01	SFP Cleanup & Cooling System
14.2.12.1.79	Nuclear Service Cooling Water Sys.	5P-A-EF-01	Nuclear Service Cooling Water System
14.2.12.1.80	NSCW Screens & Pumps	5P-A-EF-02	NSCW Screens & Pumps
14.2.12.1.81	Component Cooling Water System	5P-A-EG-01	Component Cooling Water System
14.2.12.1.82	Aux. Steam Generator & Auxiliary Steam System	5P-A-FA-01	Aux. S.G. & Aux. Steam System
14.2.12.1.83	Central Chilled Water System	5P-A-GB-01	Central Chilled Water System
14.2.12.1.84	Nuclear Service Cooling Water Pump House HVAC	5P-A-GD-01	NSCW Pump House HVAC
14.2.12.1.85	Turbine Building HVAC	5P-A-GE-01	TBN Building HVAC

Table 14.2-1

Preoperational Test Procedures
(Sheet 11 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.86	Auxiliary Boiler & Water Treatment Building HVAC	5P-A-GF-01	Utility Building HVAC
14.2.12.1.87	Fire Water Pump House HVAC	5P-A-GF-01	Utility Building HVAC
14.2.12.1.88	Fuel Building HVAC System	5P-A-GG-01	Fuel Building Normal AHU
		5P-A-GG-02	Fuel Building Emergency AHU
14.2.12.1.89	Radwaste Building HVAC System	5P-A-GH-01	Radwaste Control Room Supply AHU
		5P-A-GH-02	Radwaste Building HVAC General
		5P-A-GH-03	Radwaste Building HVAC Misc.
14.2.12.1.90	Essential Chilled Water System	5P-A-GJ-01	Essential Chilled Water System
14.2.12.1.91	Control Building HVAC System	5P-A-GK-01	Control Bldg. AHU Battery Room Normal Exh. Smoke Removal and Misc. Fans.
		5P-A-GK-02	Control Room Emergency HVAC
		5P-A-GK-03	Emergency Switchgear/Battery Rooms HVAC
14.2.12.1.92	Auxiliary Building HVAC System	5P-A-GL-01	Aux. Building Exhaust AHU

Table 14.2-1

Preoperational Test Procedures
(Sheet 12 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
		5P-A-GL-02	Aux. Building Supply AHU
		5P-A-GL-03	Aux. Building Equipment Room AHU
14.2.12.1.93	Diesel Generator Building HVAC	5P-A-GM-01	D/G Building HVAC
14.2.12.1.94	Reactor Cavity and Support Cooling System	5P-A-GN-01	Rx. Cavity and Support Cooling
14.2.12.1.95	Containment Fan Cooling System	5P-A-GN-02	Containment Fan Coolers
14.2.12.1.96	CRDM Cooling Fans System	5P-A-GN-03	CRDM Cooling Fans
14.2.12.1.97	Steam Generator Recirculation Fans	5P-A-GN-04	S/G Recirculation Fans
14.2.12.1.98	Containment Structural Integrity Test (SIT)	5P-A-GP-01	Containment Structural Integrity (SIT)
14.2.12.1.99	Containment Integrated Leak Rate Test (ILRT)	5P-A-GP-02	Containment Integrated Leak Rate (ILRT) (Type A)
		5P-A-GP-03	Containment Local Leak Rate (Type B)
		5P-A-GP-04	Containment Local Leak Rate (Type C)
14.2.12.1.100	Containment Air Purification System	5P-A-GT-01	Containment Air Purification System

Table 14.2-1

Preoperational Test Procedures
(Sheet 13 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.101	Containment Combustible Gas Control System	5P-A-GT-02	Containment Combustible Gas Control System
14.2.12.1.102	Access Control Building HVAC	5P-A-GX-01	Access Control Building HVAC
14.2.12.1.103	Steam Generator Blowdown Heat Exchanger HVAC	5P-A-GY-01	S/G Blowdown Bldg. HVAC
14.2.12.1.104	Chlorination Building HVAC		
14.2.12.1.105	Gaseous Radwaste System	5P-A-HA-01	Gaseous Radwaste System
14.2.12.1.106	Liquid Radwastes System	5P-A-HB-01	Liquid Radwaste System
14.2.12.1.107	Waste Evaporator System	5P-A-HB-02	Waste Evaporator System
14.2.12.1.108	Radwaste Solidification System	5P-A-HC-01	Radwaste Solidification System
14.2.12.1.109	Resin Transfer System	5P-A-HC-02	Resin Transfer System
14.2.12.1.110	Boron Recycle Sys.	5P-A-HE-01	Boron Recycle Sys.
14.2.12.1.111	Auxiliary Building Radioactive Drains	5P-A-HG-01	Auxiliary Building Radioactive Drain System
		5P-A-HG-05	Auxiliary Building Radioactive Drain System

Table 14.2-1

Preoperational Test Procedures
(Sheet 14 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.112	Miscellaneous Building Radioactive Drains	5P-A-HG-02	Miscellaneous Building Radioactive Drain System
14.2.12.1.113	Containment Building Radioactive Drains	5P-A-HG-03	Containment Bldg. Radioactive Drain System
14.2.12.1.114	Radwaste Building Radioactive Drains	5P-A-HG-04	Radwaste Building Radioactive Drain System
14.2.12.1.115	Radioactive Laundry System	5P-A-HH-01	Radioactive Laundry System
14.2.12.1.116	Nuclear Sampling System	5P-B-HI-01	Nuclear Sampling System
14.2.12.1.117	Auxiliary Fuel Oil Storage and Transfer	5P-A-JA-01	Auxiliary Fuel Oil Storage and Transfer System
14.2.12.1.118	Compressed Air System	5P-A-KA-01	Compressed Air System Loss of Instrument Air Test (To be Coordinated with NSSS)
14.2.12.1.119	Fire Protection System (Water)	5P-A-KC-01	Fire Protection System (Water)
14.2.12.1.120	Seismic Fire Protection System	5P-A-KC-02	Seismic Fire Protection System
14.2.12.1.121	Domestic Water System	5P-A-KD-01	Domestic Water System

Table 14.2-1

Preoperational Test Procedures
(Sheet 15 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.122	Spent Fuel Pool Crane	5P-A-KE-01	Fuel Handling and Transfer System (Including Cranes)
14.2.12.1.123	New Fuel Elevator	5P-A-KE-01	Fuel Handling and Transfer System (Including Cranes)
14.2.12.1.124	Fuel Handling and Storage	5P-A-KE-01	Fuel Handling and Transfer System (Including Cranes)
		5P-A-KE-02	Cask Handling Crane
14.2.12.1.125	Fuel Transfer System	5S-C-KE-02	Check out of Fuel Transfer System
14.2.12.1.126	Refueling Machine and RCC Change Fixture	5S-C-KE-01	Fuel Handling Tool and Fixtures
14.2.12.1.127	Refueling Machine Indexing Test	5S-C-KE-01	Fuel Handling Tool and Fixtures
14.2.12.1.128	Polar Crane	5P-A-KF-01	Polar Crane
14.2.12.1.129	Service Gas Systems	5P-A-KH-01	Service Gas Sys.
		5P-A-CC-01	Gen H_2 and CO_2 System
14.2.12.1.130	Diesel Generator Fuel Oil System	5P-A-KJ-01	Diesel Generator Fuel Oil System
14.2.12.1.131	Diesel Generator Mechanical	5P-A-PE-04	Diesel Generator Controls Pre-op Test
14.2.12.1.132	Oily Waste System	5P-A-LE-01	Oily Waste System

Table 14.2-1

Preoperational Test Procedures
(Sheet 16 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.133	Non-Radioactive Gravity Collection Drains	5P-A-LF-01	Non-Radioactive Gravity Collection Drains
14.2.12.1.134	Main and Auxiliary Transformer	5P-A-MA-01	Main and Aux. Transformer & Generator Protection
		5P-A-AC-04	Main and Aux. Transformer & Generator Protection
		5P-B-AC-03	Main and Aux. Transformer & Generator Protection
14.2.12.1.135	Generator Excitation and Voltage Regulation	5P-A-MB-01	Excitation and Voltage Regulation
		5P-A-MB-02	Main Exciter Rectification System
		5P-B-MB-01	Excitation and Voltage Regulation
14.2.12.1.136	Startup Transformer X01	5P-A-MC-01	Startup Transformer (X01)
14.2.12.1.137	Startup Transformer X02	5P-A-MC-02	Startup Transformer (X02)
14.2.12.1.138	13.8KV System	5P-A-NA-01	13.8KV System
14.2.12.1.139	4.16KV (Non-Class 1E) System	5P-A-NB-01	4.16KV (Non-Class 1E) System
14.2.12.1.140	Non-Class 1E Diesel Generator	5P-A-NE-01	Non-Class 1E Diesel Generator

Table 14.2-1

Preoperational Test Procedures
(Sheet 17 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.141	480V (Non-Class 1E) System	5P-A-NG-01	480V (Non-Class 1E) System
14.2.12.1.142	250V DC System	5P-A-NJ-01	250V DC System
14.2.12.1.143	125V (Non-Class 1E) DC System	5P-A-NK-01	125V (Non-Class 1E) DC System
14.2.12.1.144	Plant Computer Power Supply Sys.	5P-A-NQ-02	Plant Computer Power System
14.2.12.1.145	Instrument 120V AC (Non-Class 1E) System	5P-A-NQ-01	Instrument 120V (Non-Class 1E) System
14.2.12.1.146	4.16KV (Class 1E) System	5P-A-PB-01	4.16KV (Class 1E) System
14.2.12.1.147	Diesel Generator Electrical	5P-A-PE-01	Diesel Generator Electrical
14.2.12.1.148	Diesel Generator Load Sequencing	5P-A-PE-02	Diesel Generator Load Sequencing
14.2.12.1.149	Diesel Generator Load Group Assign-ments	5P-A-PE-03	Diesel Generator Load Group Assign-ments (To be Co-ordinated with NSSS)
14.2.12.1.150	480V (Class 1E) System	5P-A-PG-01	480V (Class 1E) System
14.2.12.1.151	125V (Class 1E) DC System	5P-A-PK-01	125V (Class 1E) DC System
14.2.12.1.152	Instrument 120V AC (Class 1E) System	5P-A-PQ-01	Instrument 120V AC (Class 1E) System

Table 14.2-1

Preoperational Test Procedures
(Sheet 18 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.153	Emergency Lighting System	5P-A-QD-01	Emergency Lighting System
14.2.12.1.154	Public Address System		
14.2.12.1.155	Cathodic Protection System	5P-A-QH-01	Cathodic Protection System
14.2.12.1.156	Heat Tracing/ Freeze Protection System	5P-A-QJ-01	Heat Tracing/ Freeze Protection System
14.2.12.1.157	Fire Detection and Alarm	5P-A-QK-01	Fire Detection and Alarm System
14.2.12.1.158	Special Process Heat Tracing	5P-A-QM-01	Boric Acid Heat Tracing System (CVCS)
14.2.12.1.159	Non-Radioactive Liquid Sampling	5P-A-RC-01	Non-Radioactive Liquid Sampling System
		5P-B-RC-01	Non-Radioactive Liquid Sampling and Analysis Sys. 462
14.2.12.1.160	Plant Security System		
14.2.12.1.161	BOP Engineered Safeguards (ESFAS)	5P-A-SA-01	NSSS Engineering Safeguards (ESFAS)
14.2.12.1.162	Safeguards Test Without Blackout	5P-A-SA-01	NSSS Engineering Safeguards (ESFAS)
14.2.12.1.163	Safeguards Test With Balckout	5P-A-PE-02	Diesel Generator Load Sequencing

Table 14.2-1

Preoperational Test Procedures
(Sheet 19 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.164	Reactor Protection System Initial Energization		
14.2.12.1.165	Reactor Protection System Functional Test	5S-C-SB-02	Rx. Protection System Operational Check
14.2.12.1.166	Reactor Protection System Logic Test	SP-A-SB-01	Reactor Protection System (SSPS) Logic Testing
14.2.12.1.167	Reactor Trip Switchgear Test		
14.2.12.1.168	Reactor Protection Time Response Test	5S-C-SB-01	Rx. Protection System Time Response Measurement
14.2.12.1.169	Containment Isolation		
14.2.12.1.170	Safeguards Test Cabinet Energization and Test Relay Functional Test	5P-A-SB-02	Safeguards Test Cabinet Energization and Preop. Testing
14.2.12.1.171	Safeguards Test Cabinet Preoperational Test	5P-A-SB-02	Safeguards Test Cabinet Energization and Preop. Testing
14.2.12.1.172	Process Protection and Control Cabinet Initial Energization	5C-I-138	Initial Energization of the Westinghouse 7,300 Series Process Instrumentation Cabinets

Table 14.2-1

Preoperational Test Procedures
(Sheet 20 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.173	Area Radiation Monitoring (SP-SD-01)	5P-A-SD-01	Digital Radiation Monitoring System
14.2.12.1.174	Nuclear Instrumentation Initial Energization and Calibration	5P-A-SE-01	Initial Energization of Nuclear Instrument System and Preoperation Testing
14.2.12.1.175	Nuclear Instrumentation Preoperational Test	5P-A-SE-01	Initial Energization of Nuclear Instrument System and Preop. Testing
14.2.12.1.176	Rod Control System	5P-A-SF-02	General Checkout Control System
		5C-I-146	Initial Energization of Rod Control Equipment
14.2.12.1.177	Rod Position Indication System	5P-A-SF-03	General Checkout DRPI System
14.2.12.1.178	Seismic Instrumentation	5P-A-SG-01	Seismic Instrumentation
14.2.12.1.179	Process Radiation Monitoring System	5P-A-SD-01	Digital Radiation Monitoring System
14.2.12.1.180	Thermal Expansion Test (Balance of Plant)	5P-B-XX-04	Thermal Expansion & Snubber/Hanger Travel Check
14.2.12.1.181	Steady-State Vibration and Transient Effects (Balance of Plant)	5P-A-XX-02	Piping Vibration Steady State, Cold & Hot

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Table 14.2-1

Preoperational Test Procedures
(Sheet 21 of 21)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.1.182	Steady-State and Dynamics Effects During Hot Functional Test	5P-A-XX-02	Piping Vibration Steady State, Cold & Hot
14.2.12.1.183	Thermal Expansion Test (Westinghouse Supplied Restraints)	5P-B-XX-04	Thermal Expansion & Shubber/Hanger Travel Check

SPECIFIC INFORMATION TO BE
INCLUDED IN THE FSAR

Table 14.2-2

Power Ascension Test Procedures
(Sheet 1 of 9)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.2.1	Core Loading Prerequisites and Periodic Checkoff	5S-C-XX-01	Core Loading Prerequisites and Periodic Checkoff
14.2.12.2.2	Reactor Coolant System Boron Concentration Sampling	5S-C-HI-01	RCS Sampling for Core Loading
14.2.12.2.3	Core Loading Insturmentation and Neutron Source Requirement	5S-C-SC-01	Core Loading Instrumentation and Neutron Source Requirement
14.2.12.2.4	Initial Fuel Loading	5S-C-XX-02	Initial Core Loading Test Sequence
14.2.12.2.5	Incore Movable Detector System Checkout	5S-D-SE-01	Incore Movable Detector (After Core Load)
14.2.12.2.6	Control Rod Drive Mechanism Operation Test (Cold)	5S-D-SF-01	CRDM Operational Test
14.2.12.2.7	Rod Drop Time Measurement (Cold)	5S-D-SF-05	Rod Drop Time Measurement (Cold)
14.2.12.2.8	Vibration and Loose Parts Monitoring (Cold)	5S-C-SQ-01	Vibration and Loose Parts Monitoring (Cold)
14.2.12.2.9	Control System Test for Turbine Runback Operation (NSSS only)	5S-C-AC-01	Control System Test for Turbine Runback Operation (NSSS only)

Table 14.2-2

Power Ascension Test Procedures
(Sheet 2 of 9)

Test		Test Procedure	
FSAR Para No.	Title	Test No.	Title
14.2.12.2.10	Incore Temperature Controller and Resistance Temperature Detector Cross-Calibration	5P-B-SC-01	Incore Thermocouple and RTD Cross-Calibration
14.2.12.2.11	Reactor Coolant System Leak Rate Test	STP*-78,79 and 80	RCS Operational Leakage Test
14.2.12.2.12	Rod Position Indication System Test	5S-D-SF-03	Rod Position Indication System Test
14.2.12.2.13	Reactor Coolant System Flow Measurement	5S-D-BB-02	Reactor Coolant System Flow Measurement
14.2.12.2.14	Reactor Coolant System Coastdown	5S-D-BB-03	Reactor Coolant System Coastdown Measurement
14.2.12.2.15	Resistance Temperature Detector Bypass Loop Flow Verification	5S-D-BB-04	Resistance Temperature Detector Bypass Loop Flow Verification
14.2.12.2.16	Pressurizer Effectiveness Test	5S-D-BB-01	PZR Spray and HTR Capability and Continuous Spray Flow Setting
14.2.12.2.17	Control Rod Drive Mechanism Operation Test (Hot)	5S-D-SF-01	CRDM Operational Test

* STP: Surveillance Test Procedure

Table 14.2-2

Power Ascension Test Procedures
(Sheet 3 of 9)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.2.18	Rod Drop Time Measurement (Hot)	5S-D-SF-05	Rod Drop Time Measurement (Cold)
14.2.12.2.19	Rod Control Test	5S-D-SF-02	Rod Control System
14.2.12.2.20	Initial Setpoint Verification	5S-D-SF-03	Reactor Plant System Setpoint Verification
14.2.12.2.21	Chemical Test at Power	5S-E-HI-01	Chemical Test at Power
14.2.12.2.22	Dynamic Automatic Steam Dump Con-trol Test	5S-D-AB-01	Dynamic Automatic Steam Dump Control Test
14.2.12.2.23	Secondary System Warmup	GOP*-12	Secondary Plant Heatup Warmup
14.2.12.2.24	Initial Turbine Roll and Turbine Check	5P-B-AC-01	TBN-GEN Startup Sequence and Initial TBN Operation
14.2.12.2.25	Turbine Control System Checkoff	5P-A-AC-03	Main Turbine Governer
14.2.12.2.26	Turbine Overspeed Trip Test	5P-B-AC-01	TBN-GEN Startup Sequence and Initial TBN Operation

* GOP: General Operating Procedure

Table 14.2-2

Power Ascension Test Procedures
(Sheet 4 of 9)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.2.27	Turbine Generator Checkout	5P-A-AC-01	Main Turbine Protection and Tripping
		5P-A-AC-04	Generator Protection
14.2.12.2.28	Initial Synchronization and 30 percent Power Test Sequence	5S-E-XX-16	Initial Synchronization and 30 percent Power Test Sequence
14.2.12.2.29	Automatic Steam Generator Level Control Verification at Power	5S-E-AE-02	Automatic Steam Generator Level Control Verification at Power
14.2.12.2.30	Feed Pump Speed Control Tests	5P-A-AE-01	Main Feed Water System
14.2.12.2.31	Automatic Reactor Controls Test	5S-E-SF-01	Automatic Reactor Control Verification at Power
14.2.12.2.32	Rod Cluster Control Assembly Pseudo-Rod Ejection Test	5S-E-XX-01	Initial Synchronization and 30% Power Test Sequence
14.2.12.2.33	Power Coefficient and Power Defect Measurement	5S-E-XX-11	Power Coefficient Determination
14.2.12.2.34	30 Percent Load Swing Test	5S-E-XX-21	Load Swing Test

Table 14.2-2

Power Ascension Test Procedures
(Sheet 5 of 9)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.2.35	Static Rod Control Assembly Drop and Rod Cluster Control Assembly Below Bank Position Measurement	5S-E-XX-17	Test Sequence at 50% Power
14.2.12.2.36	Rod Drop Test	5S-E-XX-24	Rod Drop and Plant Trip
14.2.12.2.37	Shutdown From Outside the Control Room	5S-E-XX-31	Shudown From Outside the Control Room
14.2.12.2.38	Loss of Offsite Power	5S-E-XX-26	Loss of Offsite Power
14.2.12.2.39	Steam Generator Moisture Carryover Test	5S-E-XX-25	Steam Generator Moisture Carryover Test
14.2.12.2.40	Main and Reheat Steam System Functional Test	5P-A-AC-05	MSR System
14.2.12.2.41	Incore/Excore Calibration and Axial Flux Difference (AFD) Instrument Calibration	5S-E-SC-05	Axial Flux Difference Instrumentation Calibration
14.2.12.2.42	75 Percent Load Swing Test	5S-E-XX-31	Load Swing Test
14.2.12.2.43	Large Load Reduction Test at 75 percent Power	5S-E-XX-22	Large Load Reduction

Table 14.2-2

Power Ascension Test Procedures
(Sheet 6 of 9)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.2.44	100 percent Power Load Swing Test	5S-E-XX-21	Load Swing Test
14.2.12.2.45	Large Load Reduction Test at 100 percent Power	5S-E-XX-22	Large Load Reduction
14.2.12.2.46	Plant Trip from 100 percent Power	5S-E-XX-23	Plant Trip from 100 percent Power
11 14.2.12.2.48	Nuclear Steam Supply System Acceptance Test	5S-E-XX-27	Nuclear Steam Supply System Acceptance Test
14.2.12.2.49	Nuclear Instrumentation System Setpoint Adjustments and Power Range Calibrations	5S-E-SC-01	Operational Alignment of Nuclear Instruments
14.2.12.2.50	Thermal Power Measurement and Statepoint Data Collection	5S-E-XX-13	Thermal Power Measurement and Statepoint Data Collection
14.2.12.2.51	Radiation Surveys	5S-E-XX-15	Radiation Shield Survey
14.2.12.2.52	Adjustment to the Reactor Control System	5S-D-BB-05	Startup Adjustment of Reactor Control System

Table 14.2-2

Power Ascension Test Procedures
(Sheet 7 of 9)

Test		Test Procedure	
FSAR Prar. No.	Title	Test No.	Title
14.2.12.2.53	Calibration of Steam and Feed-water Flow Instrumentation	5S-E-AE-01	Calibration of Steam and Feed Flow
14.2.12.2.54	Operational Alignment of Process Temperature Instrumentation and Setpoint Adjustment	5S-D-BB-06	Operational Alignment of Process Temperature Instrumentation
14.2.12.2.55	Initial Criticality	5S-E-XX-03	Initial Criticality and Low Power Sequence
14.2.12.2.56	Boron Endpoint Determination	5S-E-XX-04	Boron Endpoint Determination
14.2.12.2.57	Isothermal Temperature Coefficent Measurement	5S-E-XX-05	Isothermal Temperature Coefficent Measurement
14.2.12.2.58	Core Flux Map with All Rods Out	5S-E-SC-03	Incore Movable Detector Flux Mapping at Low Power
14.2.12.2.59	Rod Worth Measurement Test	5S-E-XX-07	RCCA or Bank Worth Measurement at Zero Power
14.2.12.2.60	Rod Cluster Control Assembly Pseudo-Ejection at Zero Power	5S-E-XX-03	Initial Criticality and Low Power Test Sequence

Table 14.2-2

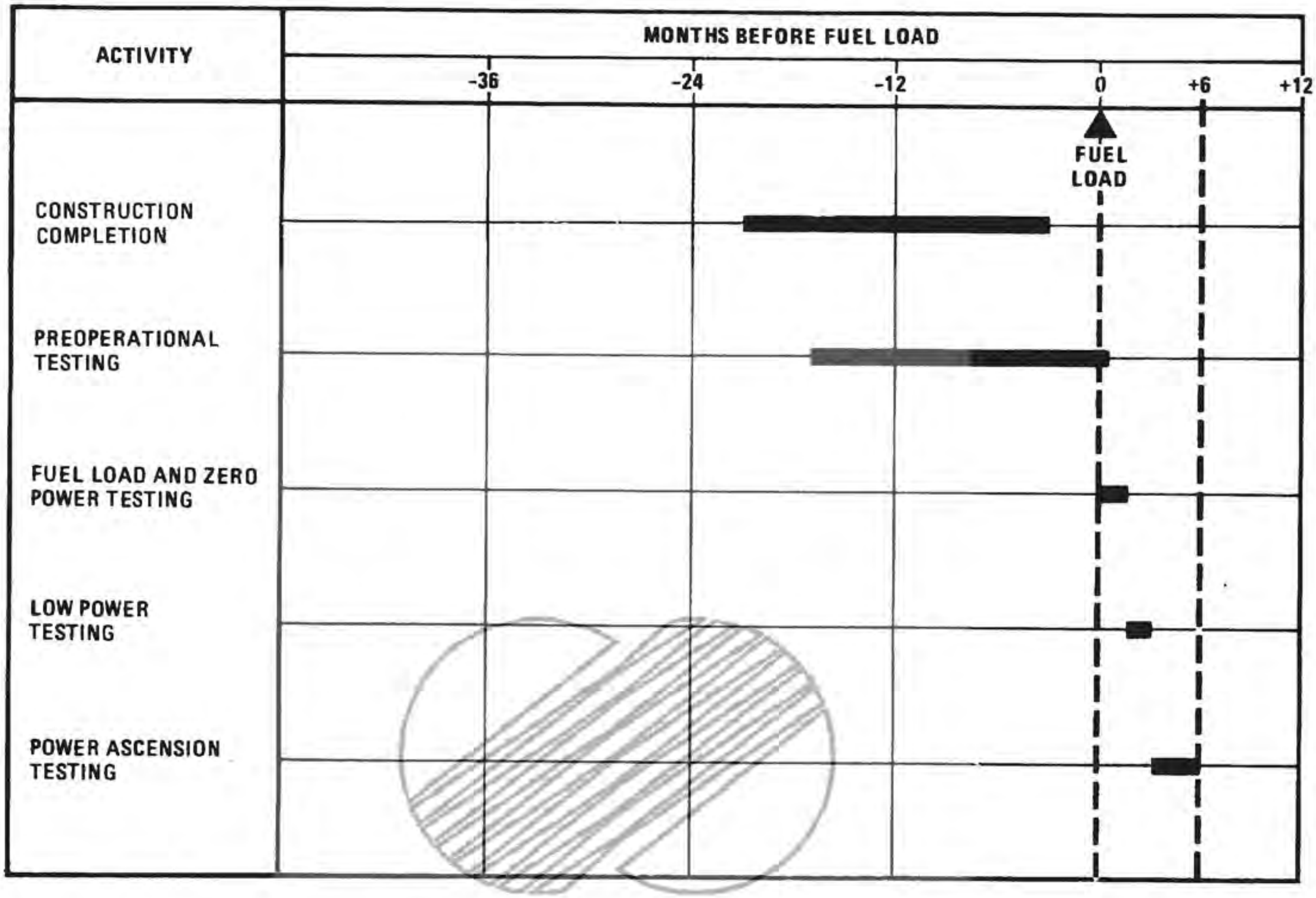
Power Ascension Test Procedures
(Sheet 8 of 9)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.2.61	Natural Circulation Test	5S-E-XX-30	RCS Natural Cooldown
14.2.12.2.62	Startup Test Program Sequence Document	5S-E-XX-02	Startup Test Program Sequence Document
14.2.12.2.63	ICRR Monitoring for Core Loading	5S-C-SC-02	ICRR Monitoring for Core Loading
14.2.12.2.64	Post Core Loading Precritical Test Sequence	5S-D-XX-01	Post Core Loading Precritical Test Sequence
14.2.12.2.65	Initial Criticality and Low Power Test Sequence	5S-E-XX-03	Initial Criticality and Low Power Test Sequence
14.2.12.2.66	ICRR Monitoring for Approach to Initial Criticality	5S-E-SC-08	ICRR Monitoring for Approach to Initial Criticality
14.2.12.2.67	Reactivity Computer Checkout	5S-E-SC-07	Reactivity Computer Checkout
14.2.12.2.68	Determination of Core Power Range for Physics Testing	5S-E-SC-02	Determination of Core Power Range for Physics Testing
14.2.12.2.69	Incore Movable Detector and Thermocouple Mapping	5S-E-SC-06	Incore Movable Detector and T/C Mapping at Power

Table 14.2-2

Power Ascension Test Procedures
(Sheet 9 of 9)

Test		Test Procedure	
FSAR Para. No.	Title	Test No.	Title
14.2.12.2.70	Test Sequence at 50 percent Power	5S-E-XX-17	Test Sequence at 50 percent Power
14.2.12.2.71	Test Sequence at 75 percent Power	5S-E-XX-18	Test Sequence at 75 percent Power
14.2.12.2.72	Test Sequence at 90 percent Power	5S-E-XX-19	Test Sequence at 90 percent Power
14.2.12.2.73	Test Sequence at 100 percent Power	5S-E-XX-20	Test Sequence at 100 percent Power

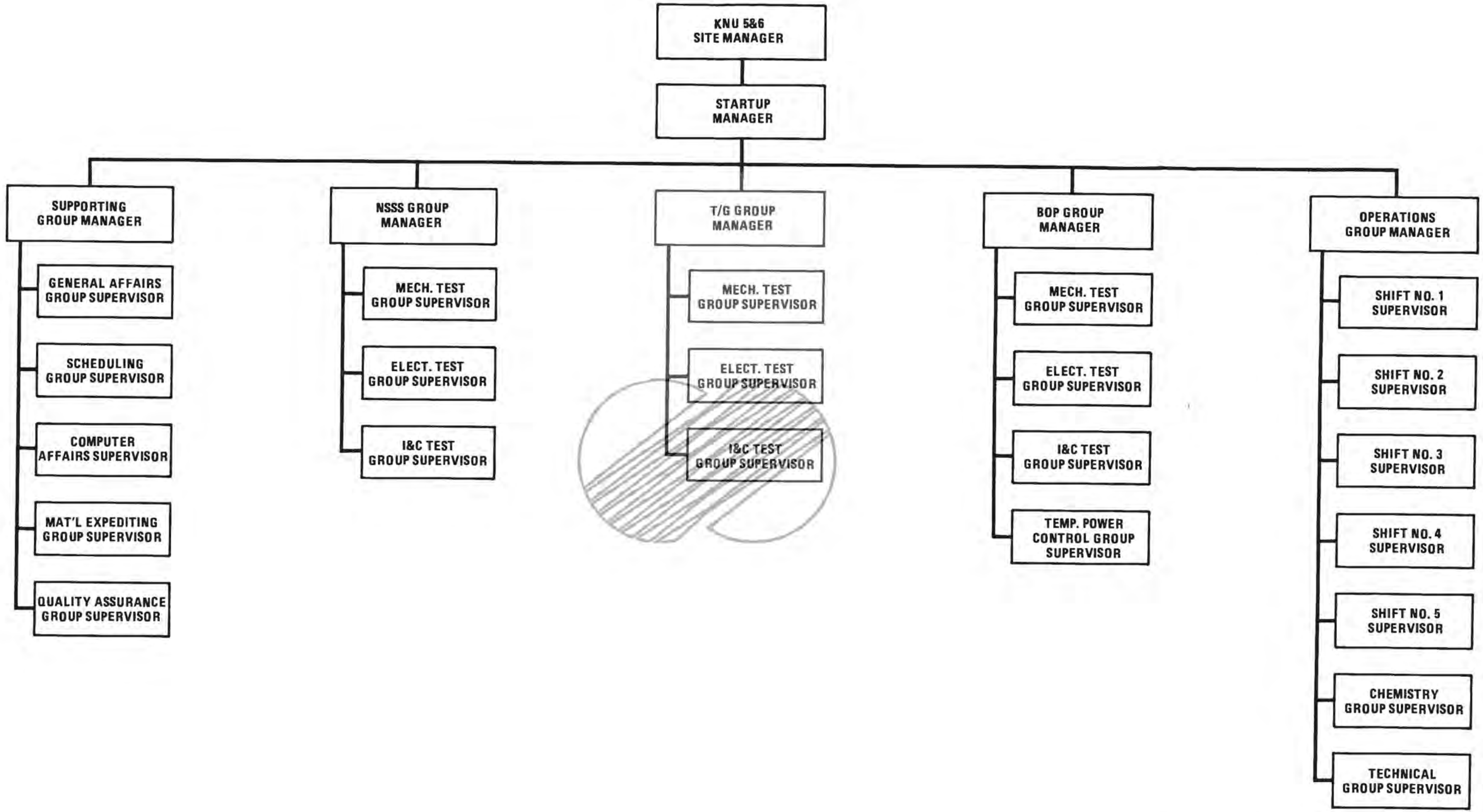


KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
FSAR

INITIAL TEST PROGRAM SCHEDULE

Figure 14.2-1

9/21/82



KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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STARTUP ORGANIZATION

Figure 14.2-2

2/10/83

	SEPTEMBER 1982				OCTOBER				NOVEMBER					ENERGIZATION ▽ DECEMBER				JANUARY 1983					FEBRUARY				MARCH				APRIL				MAY	
PROCEDURE NUMBER	82	81	80	79	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51	50	49	48	47
5P-NK-01			O																																	
5P-PK-01			O																																	
5P-NQ-01					O																															
5P-NQ-02					O																															
5P-PQ-01					O																															
5P-KC-01										O																										
5P-NB-01														O																						
5P-PB-01														O																						
5P-MC-01														O																						
5P-MC-02														O																						
5P-NG-01																O																				
5P-PG-01																O																				
5P-NA-01																			O																	
5P-KA-01																						O														
5P-GF-01																							O													
5P-GF-02																							O													
5P-EA-01																								O												
5P-GK-01																								O												
5P-DD-01																								O												
5P-QD-01																									O											
5P-AM-01																										O										
5P-QH-01																											O AS REQUIRED →									
5P-KF-01																											O									
5P-JA-01																												O								
5P-KD-01																												O								
5P-NJ-01																												O								
5P-AN-01																													O							
5P-QJ-01																														O						
5P-DC-01																														O						
5P-AP-01																														O						
5P-EB-01																																O				
5P-FA-01																																O				
5P-GB-01																																	O			
5P-GE-01																																	O			
5P-GD-01																																	O			
5P-LE-01																																		O		
5P-EF-02																																			O	
5P-EF-01																																				O
5P-GL-01																																				O
5P-GA-01																																				O
5P-EG-01																																				O

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
FSAR

PREOPERATIONAL TEST SEQUENCE
(Sheet 1 of 5)

Figure 14.2-3

1983 — SECONDARY HYDRO (between weeks 36 and 35) — COLD HYDRO (between weeks 27 and 26) — ILRT (between weeks 18 and 17) — HFT (between weeks 14 and 13) — 1984

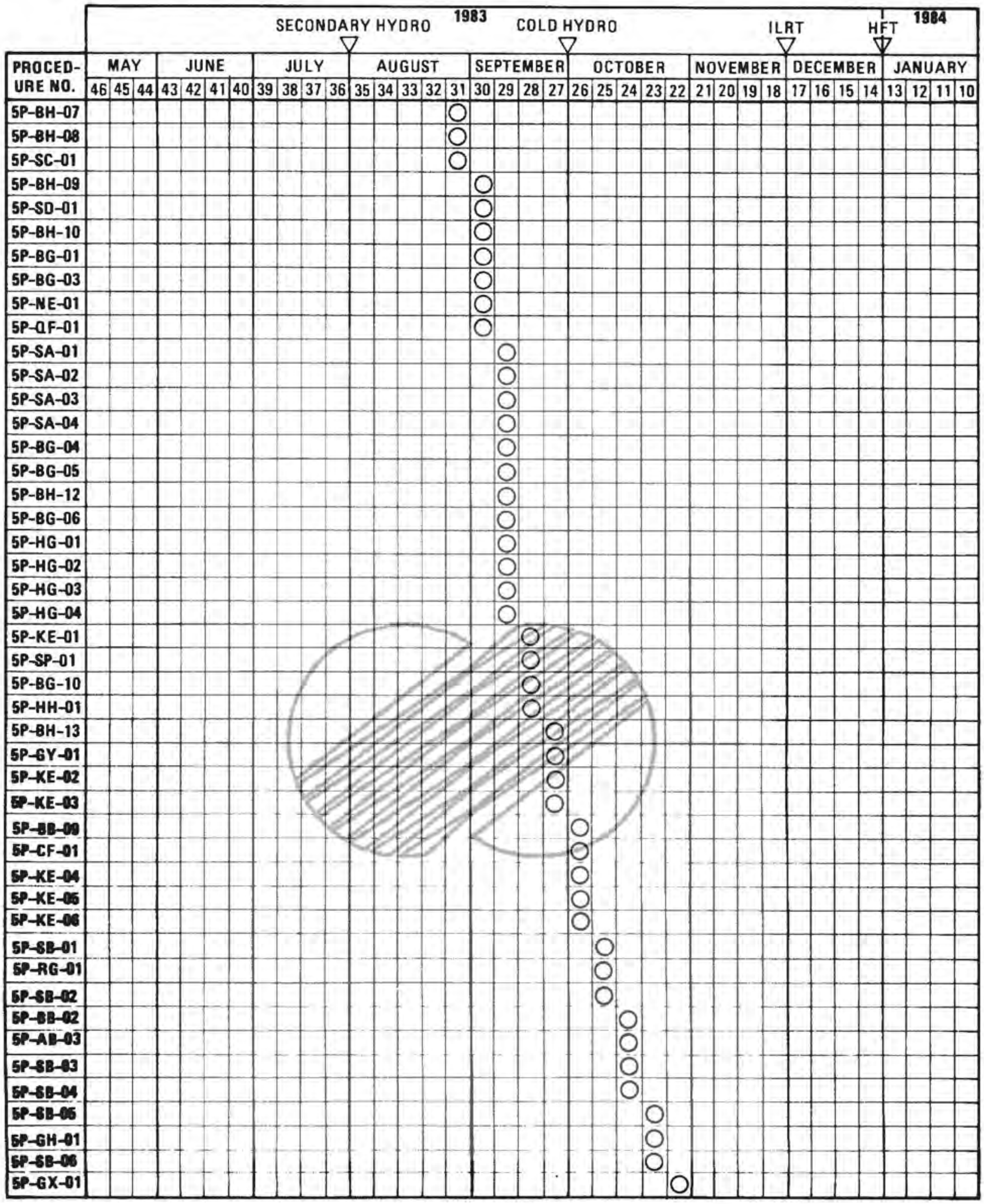
PROCEDURE NO.	MAY			JUNE				JULY				AUGUST					SEPTEMBER				OCTOBER					NOVEMBER				DECEMBER				JANUARY			
	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
5P-LF-01	O																																				
5P-AQ-01	O																																				
5P-BL-01	O																																				
5Q-SF-01	O																																				
5P-SF-02	O																																				
5P-AK-01				O																																	
5P-EC-01				O																																	
5P-BN-01				O																																	
5P-KH-01					O																																
5P-AK-02						O																															
5P-DA-02							O																														
5P-RC-01							O																														
5P-AQ-01							O																														
5P-DA-01								O																													
5P-AD-01								O																													
5P-AL-01								O																													
5P-AL-02								O																													
5P-GY-02								O																													
5P-GJ-01									O																												
5P-GM-01											O																										
5P-BC-02											O																										
5P-BC-01											O																										
5P-BC-04												O																									
5P-BC-03												O																									
5P-AE-01												O																									
5P-BK-01													O																								
5P-BK-02													O																								
5P-KJ-01													O																								
5P-KJ-02													O																								
5P-BH-02													O																								
5P-BH-04													O																								
5P-PE-01													O																								
5P-GN-01													O																								
5P-GN-02													O																								
5P-GN-03														O																							
5P-GN-04														O																							
5P-PE-02														O																							
5P-BH-05														O																							
5P-PE-03															O																						
5P-BH-06															O																						
5P-BH-01															O																						
5P-GT-01															O																						
5P-GT-02															O																						

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
FSAR

PREOPERATIONAL TEST SEQUENCE
(Sheet 2 of 5)

Figure 14.2-3

2/23/83



KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
FSAR

PREOPERATIONAL TEST SEQUENCE
(Sheet 3 of 5)

Figure 14.2-3

1983: SECONDARY HYDRO ▽ (between weeks 36 and 35) — COLD HYDRO ▽ (weeks 27/26) — ILRT ▽ (week 18) — HFT ▽ (weeks 14/13) — 1984

PROCEDURE NO.	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
	MAY			JUNE				JULY				AUGUST					SEPTEMBER				OCTOBER					NOVEMBER				DECEMBER				JANUARY			
5P-SB-07																									O												
5P-SB-08																									O												
5P-HE-11																										O											
5P-BB-01																										O											
5P-HA-01																										O											
5P-GG-01																											O										
5P-KC-02																											O										
5P-HB-01																												O									
5P-HB-02																												O									
5P-QK-01																													O								
5P-MB-01																													O								
5P-SE-01																													O								
5P-SG-01																													O								
5P-SE-02																														O							
5P-GP-01																														O							
5P-GP-02																														O							
5P-CB-01																														O							
5P-CH-01																														O							
5P-CH-02																															O						
5P-MA-01																																O					
5P-CJ-01																																O					
5P-CD-01																																O					
5P-CC-01																																		O			
5P-CE-01																																		O			
5P-QM-01																																			O		
5P-HC-01																																					O
5P-HC-02																																					O

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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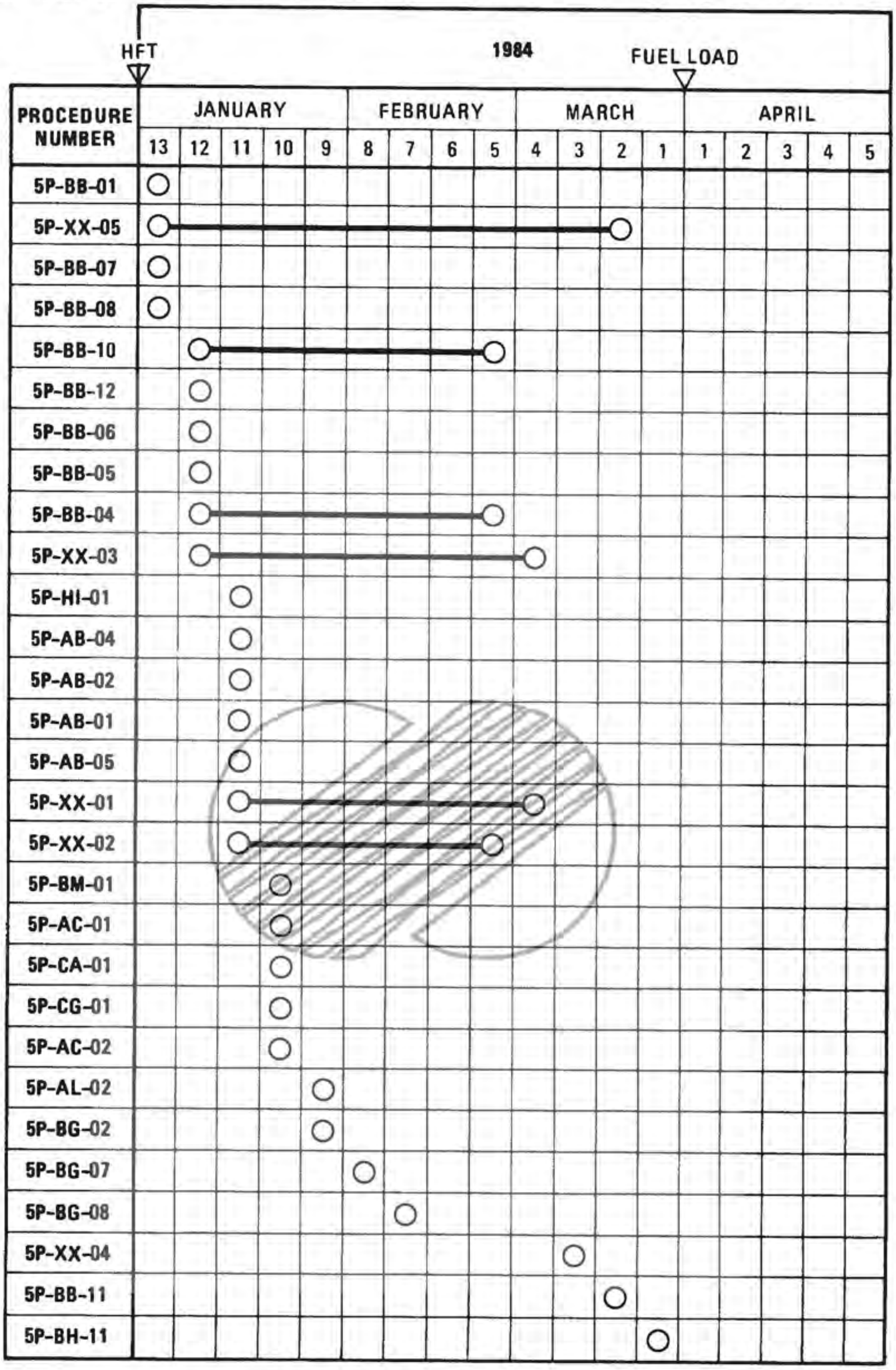
PREOPERATIONAL TEST SEQUENCE
(Sheet 4 of 5)

Figure 14.2-3

2/23/83



KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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PREOPERATIONAL TEST SEQUENCE
(Sheet 5 of 5)

Figure 14.2-3

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-C-XX-01	Core Loading Prerequisites and Periodic Checkoff										
5S-C-HI-01	RCS Sampling for Core Loading										
5S-C-SC-01	Core Loading Instrumentation and Neutron Source Requirement										
5S-C-XX-02	Initial Core Loading Test Sequence										
5S-D-SE-01	Incore Movable Detector (After Core Load)										
5S-D-SF-01	CRDM Operational Test										
5S-D-SF-05	Rod Drop Time Measurement (Cold)										
5S-C-SQ-01	Vibration and Loose Parts Monitoring (Cold)										
5S-C-AC-01	Control System Test for Turbine Runback Operation (NSSS only)										
5S-E-XX-02	Startup Test Program Sequence Document										
5S-C-SC-02	ICRR Monitoring for Core Loading										

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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POWER ASCENSION TEST SEQUENCE

(Sheet 1 of 10)

Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5P-P-SC-01	Incore Thermocouple and RTD Cross-Calibration										
STP-78,79 and 80	RCS Operational Leakage Test										
5S-D-SF-03	Rod Position Indication System Test										
5S-D-BB-02	Reactor Coolant System Flow Measurement										
5S-D-BB-03	Reactor Coolant System Coastdown Measurement										
5S-D-BB-04	Resistance Temperature Detector Bypass Loop Flow Verification										
5S-D-BB-01	PZR Spray and HTR Capability and Continuous Spray Flow Setting										
5S-D-SF-01	CRDM Operational Test										
5S-D-XX-01	Post Core Loading Precritical Test Sequence										
5S-E-XX-03	Initial Criticality and Low Power Test										
5S-E-SC-08	ICRR Monitoring for Approach to Initial Criticality										

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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POWER ASCENSION TEST SEQUENCE
(Sheet 2 of 10)
Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-E-SC-07	Reactivity Computer Checkout										
5S-E-SC-02	Determination of Core Power Range for Physics Testing										
5S-D-SF-05	Rod Drop Time Measurement (Cold)										
5S-D-SF-02	Rod Control System										
5S-D-SF-03	Reactor Plant System Setpoint Verification										
5S-E-SC-01	Operational Alignment of Nuclear Instruments										
5S-E-XX-04	Boron Endpoint Determination										
5S-E-XX-05	Isothermal Temperature Coefficent Measurement										
5S-E-SC-03	Incore Movable Detector Flux Mapping at Low Power										
5S-E-XX-07	RCCA or Bank Worth Measurement at Zero Power										
5S-E-XX-03	Initial Criticality and Low Power Test Sequence										

POWER ASCENSION TEST SEQUENCE

(Sheet 3 of 10)

Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-E-XX-15	Radiation Shield Survey										
5S-D-BB-05	Startup Adjustment of Reactor Control System										
5S-E-HI-01	Chemical Test at Power										
5S-E-XX-30	RCS Natural Cool-down										
5S-E-AE-01	Calibration of Steam and Feed Flow										
5S-E-XX-15	Radiation Shield Survey										
5S-D-AB-01	Dynamic Automatic Steam Dump Control Test										
GOP-12	Secondary Plant Heatup Warmup										
5P-B-AC-01	TBN-GEN Startup Sequence and Initial TBN Operation										
5P-A-AC-03	Main Turbine Governer										
5P-B-AC-01	TBN-GEN Startup Sequence and Initial TBN Operation										
5P-A-AC-01	Main Turbine Protection and Tripping										

KOREA ELECTRIC POWER CORPORATION
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POWER ASCENSION TEST SEQUENCE

(Sheet 4 of 10)

Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5P-A-AC-04	Generator Protection										
5S-E-SC-01	Operational Alignment of Nuclear Instruments										
5S-E-XX-31	Shutdown from Outside the Control Room										
5S-E-XX-26	Loss of Offsite Power										
5S-E-XX-15	Radiation Shield Survey										
5S-E-HI-01	Chemical Test at Power										
5S-E-XX-16	Initial Synchronization and 30 percent Power Test Sequence										
5S-E-SC-06	Incore Movable Detector and T/C Mapping at Power										
5S-E-XX-13	Thermal Power Measurement and Statepoint Data Collection										
5S-E-AE-01	Calibration of Steam and Feed Flow										
5S-E-SC-01	Operational Alignment of Nuclear Instruments										

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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POWER ASCENSION TEST SEQUENCE
(Sheet 5 of 10)
Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-D-BB-05	Startup Adjustment of Reactor Control System						—				
5S-E-AE-02	Automatic Steam Generator Level Control Verification at Power						—				
5P-A-AE-01	Main Feed Water Sys.						—				
5S-E-SF-01	Automatic Reactor Control Verification at Power						—				
5S-E-XX-01	Initial Synchronization and 30% Power Test Sequence						—				
5S-E-XX-11	Power Coefficient Determination						—				
5S-E-XX-21	Load Swing Test						—				
5S-E-XX-17	Test Sequence at 50 percent Power							—			
5S-E-HI-01	Chemical Test at Power							—			
5S-E-SC-01	Operational Alignment of Nuclear Instruments							—			
5S-E-SC-06	Incore Movable Detector and T/C Mapping at Power							—			

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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POWER ASCENSION TEST SEQUENCE

(Sheet 6 of 10)

Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-E-XX-13	Thermal Power Measurement and Statepoint Data Collection							—			
5S-E-SC-01	Operational Alignment of Nuclear Instruments							—			
5S-E-AE-01	Calibration of Steam and Feed Flow							—			
5S-D-BB-05	Startup Adjustment of Reactor Control System							—			
5S-E-XX-17	Test Sequence at 50% Power							—			
5S-E-XX-11	Power Coefficient Determination							—			
5S-E-XX-24	Rod Drop and Plant Trip							—			
5P-A-AC-05	MSR System							—			
5S-E-SC-01	Operational Alignment of Nuclear Instruments							—			
5S-E-XX-18	Test Sequence at 75 percent Power								—		
5S-E-HI-01	Chemical Test at Power								—		
5S-E-XX-15	Radiation Shield Survey								—		

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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POWER ASCENSION TEST SEQUENCE
(Sheet 7 of 10)
Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-E-XX-13	Thermal Power Measurement and Statepoint Data Collection										
5S-E-AE-01	Calibration of Steam and Feed Flow										
5S-E-SC-06	Incore Movable Detector and T/C Mapping at Power										
5S-D-BB-05	Statup Adjustment of Reactor Control Sys.										
5S-D-BB-06	Operational Alignment of Process Temperature Instrumentation										
5S-E-SC-01	Operational Alignment of Nuclear Instruments										
5S-E-SC-05	Axial Flux Difference Instrumentation Calibration										
5S-E-XX-11	Power Coefficient Determination										
5S-E-XX-31	Load Swing Test										
5S-E-XX-22	Large Load Reduction										
5S-E-SC-01	Operational Alignment of Nuclear Instruments										

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
FSAR

POWER ASCENSION TEST SEQUENCE

(Sheet 8 of 10)

Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-E-XX-19	Test Sequence at 90 percent Power										
5S-E-XX-15	Radiation Shield Survey										
5S-E-XX-13	Thermal Power Measurement and Statepoint Data Collection										
5S-E-XX-11	Power Coefficient Determination										
5S-E-XX-20	Test Sequence at 100 percent, Power										
5S-E-SC-06	Incore Movable Detector and T/C Mapping at Power										
5S-E-HI-01	Chemical Test at Power										
5S-E-XX-15	Radiation Shield Survey										
5S-E-XX-13	Thermal Power Measurement and Statepoint Data Collection										
5S-E-SC-01	Operational Alignment of Nuclear Instruments										
5S-E-AE-01	Calibration of Steam and Feed Flow										

KOREA ELECTRIC POWER CORPORATION
KOREA NUCLEAR UNITS 5 & 6
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POWER ASCENSION TEST SEQUENCE

(Sheet 9 of 10)

Figure 14.2-4

Test Procedure		Cold Shut-down	Hot No-Load	Power							
Test No.	Test Procedure Title			5%	10%	20%	30%	50%	75%	90%	100%
5S-D-BB-06	Operational Alignment of Process Temperature Instrumentation										—
5S-D-BB-05	Startup Adjustment of Reactor Control System										—
5S-E-XX-11	Power Coefficient Determination										—
5S-E-XX-25	Steam Generator Moisture Carryover Test										—
5S-E-XX-21	Load Swing Test										—
5S-E-XX-22	Large Load Reduction										—
11 5S-E-XX-23	Plant Trip from 100 percent Power										—
5S-E-XX-27	Nuclear Steam Supply System Acceptance Test										—

KOREA ELECTRIC POWER CORPORATION
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POWER ASCENSION TEST SEQUENCE
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Figure 14.2-4