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CHAPTER 14

INITIAL TEST PROGRAM

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CHAPTER 14

14.0 INITIAL TEST PROGRAM

14.1 SPECIFIC INFORMATION TO BE INCLUDED IN PRELIMINARY SAFETY ANALYSIS REPORT

This section is not used.

14.2 INITIAL PLANT TEST PROGRAM

Section 50.34 and Appendix B of 10CFR50 require that a comprehensive test program be developed implemented, and documented to demonstrate that the plant operates satisfactorily and presents no , danger to public health and safety. The initial plant test program for Units 1 and 2 provided an opportunity for station personnel to become thoroughly familiar with plant systems and procedures and was conducted under the direction of HL&P (historical context).

14.2.1 Summary of Test Program and Objectives

The initial plant test program for Units 1 and 2 extends from the time the construction status of systems and components permits operation and testing, through the plant acceptance run at full power. This program is primarily concerned with the testing and evaluation of safety-related components, systems, and structures. However, nonsafety-related equipment important to plant operation is also included in the test program.

The program has been divided into three major test categories: prerequisite testing, preoperational/acceptance testing, and initial startup testing.

Any design feature which prevents or mitigates anticipated transients without scram (ATWS) and which is incorporated into the plant design is appropriately tested.

14.2.1.1 Prerequisite Testing. Prerequisite testing began as installation and/or construction of individual structures, components, and systems was completed. The primary objective of prerequisite testing was to verify that construction activities associated with the respective structure, component, or system were completed and documented. The testing requirements verified installation integrity and ensured that the structures, components, and systems were ready for preoperational/acceptance testing. These tests, in general, included instrument calibration, electrical continuity and megger checks, pump and motor rotation and vibration checks, cleaning, flushing, and functional testing of components.

14.2.1.2 Preoperational/Acceptance Testing. Preoperational/acceptance testing was begun as prerequisite testing on individual systems or subsystems was completed and included successful completion of hot functional testing of the Reactor Coolant System (RCS). The primary objective of preoperational testing was to verify that safety-related equipment and systems perform in accordance with design and safety requirements prior to initial fuel loading. Acceptance testing was conducted on nonsafety-related equipment and systems prior to initial fuel loading, although some may be conducted after initial fuel loading.

14.2.1.3 Initial Startup Testing. Initial startup testing begins with initial fuel loading and continues through initial criticality, zero power operation, and ascension to full-power commercial operation. Primary objectives of initial startup testing are verification of the nuclear parameters of the reactor and of the ability of the plant to operate at rated capacity without endangering public health and safety.

14.2.2 Organization and Staffing

Houston Lighting & Power Co. (HL&P) (historical context) has overall responsibility for the initial plant test program and startup of South Texas Project Electric Generating Station (STPEGS) Units 1 and 2. The startup efforts, prior to initial fuel loading of each unit, were directed by the HL&P (historical context) Startup Manager.

The STPEGS Startup Organization is responsible for establishing specific requirements for the scheduling, testing, and accomplishing prerequisite and preoperational/acceptance testing, as well as for providing the necessary direction and coordination to the groups having responsibility for specific activities in the prerequisite and preoperational test programs in order to support the project schedule.

The Nuclear Plant Operations Department (NPOD) is responsible for establishing specific requirements for scheduling, testing, and accomplishing initial startup testing, as well as for providing the necessary direction and coordination of the groups having responsibility for specific activities in the initial startup test program in order to support the project schedule. The organizations participating in the initial plant test program are discussed in the following sections.

14.2.2.1 South Texas Project Electric Generating Station Startup Organization. The STPEGS Startup Organization, is directed and coordinated by HL&P (historical context), and is augmented by contractors and vendors as deemed necessary. These personnel are integrated into the STPEGS Startup Organization and function as directed by the Startup Manager.

The Startup Manager is responsible for directing and coordinating the STPEGS Startup Organization, as well as for interacting with other project groups. The duties of key members of the STPEGS Startup Organization are as follows:

1. Startup Manager

- Manage, direct, schedule, and ensure that prerequisite and preoperational tests/acceptance tests are conducted in accordance with the Startup Manual.
- Review and approve prerequisite and acceptance test procedures, test procedure revisions, and acceptance test results in accordance with the Startup Manual.
- Turn systems over to the NPOD Plant Manager.
- Serve as chairman of the Joint Test Group (JTG).
- Approve Preoperational test procedures, procedure revisions, and test results recommended by JTG members.
- Review and recommend approval of requests for design changes identified by Startup during testing.
- Review and approve Startup Administrative Instructions in the Startup Manual.
- Establish and implement the startup certification, training, and indoctrination program.
- Receive components, subsystems/systems from Construction.

2. Test Group Supervisors

- Develop requirements for component and system releases from construction to Startup and subsequent system turnovers to NPOD.
- Direct the development of procedures for testing and collection of test data.
- Direct the conduct of mechanical, electrical, or instrument and control testing.
- Present preoperational test results with recommendations for approval to the JTG.
- Assume the duties of the Startup Manager in his absence.

3. Startup Supervisor

- Assign Startup Engineer/Technician for each test identified on assigned systems.
- Supervise the activities of, and provide guidance to, the assigned Startup Engineers/Technicians.
- Coordinate and supervise the preparation of test procedures.
- Provide technical guidance and assistance in the preparation of test procedures.
- Determine the testing requirements, sequence, and test method on assigned systems. Recommend scheduling changes as necessary to support the testing effort.
- Review and recommend approval of test procedures and test procedure modifications. Approve or recommend approval of test results.
- Coordinate system releases by establishing the prerequisites for, and recommend acceptance of, subsystem or system releases from Construction.
- Assume the duties and responsibilities of a Test Group Supervisor as assigned.

4. Startup Engineers

- Conduct work assignments in accordance with Startup Administrative Instructions.
- Prepare assigned test procedures.
- Conduct or coordinate testing on assigned systems or subsystems.
- Prepare the proper documents for resolution of deficiencies.

14.2.2.2 Nuclear Plant Operations Department. The NPOD is involved in the initial plant test program in several capacities throughout prerequisite, preoperational, and initial startup testing.

This involvement includes review of preoperational and initial startup test procedures and results and the direct participation of operating personnel in test activities. NPOD personnel assume responsibility for performing preventive and selected corrective maintenance activities on plant components when they are released from Construction to the Startup Organization. NPOD personnel are assigned to assist startup test engineers in performing tests and to operate permanent plant equipment which has been released from Construction to the Startup Organization. The NPOD directs the fuel loading and is responsible for the operation of the plant during initial startup testing.

The duties and responsibilities of the NPOD during plant operation are described in Chapter 13. The duties of key NPOD personnel with regard to the initial plant test program are summarized below.

1. Plant Manager

   The Plant Manager has overall responsibility for Plant Operations.

   The Plant Manager or his representative is a member of the JTG and provides liaison with the JTG and the NPOD. The Plant Manager provides an analysis of testing schedules, operator training schedules, and operating staff work loads in order to minimize conflicts with the initial plant test program, and also provides coordination between the operating staff and the Startup Organization. The Plant Manager coordinates required changes to plant operating procedures based upon test results. The Plant Manager has overall responsibility for the initial startup testing phase of the initial plant test program.

2. Plant Operations Manager

   The Plant Operations Manager is responsible for the proper operation of equipment in the custody of the NPOD and for ensuring that the conduct of the initial startup test program does not place the plant in an unsafe condition. He provides personnel from the Plant Operations Department as required to support testing activities. In addition, he directs the development of plant operating procedures.

   The Shift Managers report to the Plant Operations Manager for their respective unit and are responsible for the safe operation of the plant during assigned shifts. They are also responsible for the implementation of tagging procedures and have responsibility to disallow or terminate testing due to conditions which could endanger personnel or equipment, or violate Technical Specifications.

3. Maintenance Manager

   The Maintenance Manager is responsible for performing preventive and corrective maintenance on components and systems that have been released from Construction to the Startup Organization or to the NPOD. He provides personnel to support testing activities as required.

4. Technical Services Manager

   The Technical Services Manager is responsible for the proper operation of chemical process systems and for ensuring that the chemistry requirements of the initial plant test program are maintained. He will provide personnel from the Chemical Operations and Analysis Division as required to support the conduct of testing activities.

5. Plant Engineering Manager

The Plant Engineering Manager provides qualified personnel to function as Test Directors for initial startup tests and other personnel from the Plant Engineering Department as required to support testing activities. He is also responsible for the technical direction and implementation of the initial startup testing program.

6. Reactor Support Manager

The Reactor Support Manager reports to the Plant Engineering Manager and is responsible for the preparation of initial startup test procedures, supervision of activities related to the proper conduct of initial startup tests, and the review of test data.

A minimum of eight NPOD engineers, directed and coordinated by the Plant Engineering Manager are involved in initial startup testing. These personnel are assisted, as necessary, by Westinghouse and HL&P (historical context) Startup personnel. In addition, other NPOD personnel support initial startup testing by:

- Preparing procedures
- Assisting in the performance of tests
- Performing preventive and corrective maintenance on permanent plant equipment
- Operating permanently installed plant equipment for testing

Those engineers involved in initial startup testing receive training to provide them with a knowledge of the administrative controls to which they must adhere. In addition, they are familiar with previous test activities in their area of responsibility from their review of applicable preoperational and initial startup test procedures and test results.

14.2.2.3 Bechtel Energy Corporation. Bechtel Energy Corporation (BEC), under the direction of HL&P (historical context), has been designated as the Engineer of STPEGS Units 1 and 2. As the Engineer, BEC provides a representative to serve as a member of the JTG. As the Construction Manager, BEC coordinates construction activities to support test program requirements.

14.2.2.4 Westinghouse Electric Corporation. Westinghouse Installation Services provides onsite technical assistance to HL&P (historical context) during the installation, startup, testing, and initial operation of each Nuclear Steam Supply System (NSSS). Through this effort, Westinghouse aids the owner and assures itself that each NSSS is installed, started, tested, and operated in conformance with design intent. Westinghouse onsite personnel provide technical assistance and act as technical liaison with Westinghouse headquarters to resolve problems within their scope of work. The Westinghouse Site NSSS Manager serves as a member of the JTG.

14.2.2.5 Other Technical Specialists. In addition to the staff augmentation described in Section 14.2.2, HL&P (historical context) will augment the startup staff from other contractors and vendors as deemed necessary.

14.2.2.6 Joint Test Group. The JTG reviews, and recommends for approval, all preoperational test procedures and results. It is comprised of the following members:

- Startup Manager - Chairman and Approval Authority
- HL&P (historical context) NPOD Representative
- HL&P (historical context) Nuclear Engineering and Construction Representative
- BEC Engineering Representative
- Westinghouse NSSS Site Manager

Each member of the JTG has designated an alternate with full authority to act in his absence.

The JTG will perform the following functions during the STPEGS preoperational test program:

- Review and recommend approval of preoperational test procedures
- Review and recommend approval of revisions to preoperational test procedures
- Review and recommend approval of the results of preoperational test procedures

14.2.2.7 Plant Operations Review Committee. The Plant Operations Review Committee (PORC) reviews and recommends approval of safety-related initial startup test procedures. The membership of the PORC is described in the Technical Specifications.

14.2.2.8 Qualifications. The education, training, and experience requirements for those persons who conduct initial startup testing are detailed in Section 13.5.2.2.

Startup personnel who are performing, reviewing, and evaluating activities directly related to the prerequisite and preoperational test program are qualified to perform such activities through previous experience and/or training. The qualifications of these personnel conform to the requirements specified in Nuclear Regulatory Commission (NRC) Regulatory Guide (RG) 1.58, as discussed in Table 3.12-1. The following minimum levels of certification are required:

1. Startup Manager - Level III
2. Test Group Supervisor - Level II
3. Startup Supervisor - Level II
4. Startup Engineer - Level II
5. Technician - Level I

In addition, personnel assigned the responsibility for preoperational test activities shall possess the following qualifications for certification:

Level II

Level II personnel shall be high school graduates or have a General Equivalency Diploma (GED), and have three years or related experience in equivalent inspection, examination, or testing activities; or they should have completed college level work leading to an Associate Degree in a related discipline plus two years related experience in equivalent inspection, examination, or testing activities; or they should have a four-year college degree plus one year of related experience in equivalent inspection, examination, or testing activities.

Level III

Level III personnel shall have achieved six years of satisfactory performance as a Level II in the corresponding inspection, examination, or testing activities including one year with nuclear facilities; or they shall be high school graduates or have a GED, and have ten years of related experience in equivalent inspection, examination, or testing activities, including at least one year with nuclear facilities; or high school graduates or have a GED, and have eight years experience in equivalent inspection, examination, or testing activities, with at least two years as a Level II, and with at least two years associated with nuclear facilities; or they shall have completed college level work leading to an Associate Degree and seven years of related experience in equivalent inspection, examination, or testing activities, with at least two years of this experience associated with nuclear facilities; or they shall have completed college level work leading to an Associate Degree and seven years of related experience in equivalent inspection, examination, or testing activities, including sufficient training to be acquainted with the relevant quality assurance aspects of a nuclear facility and one year with nuclear facilities; or they shall have a four-year college degree plus five years of related experience in equivalent inspection, examination, or testing activities, with at least two years of this experience associated with nuclear facilities; or they should have a four-year college degree plus five years of related experience in equivalent inspection, examination, or testing activities, including sufficient training to be acquainted with the relevant quality assurance aspects of a nuclear facility, and one year with nuclear facilities.

Personnel are assigned preoperational test activities based upon a task analysis, considering task requirements and experience. Site-specific training is conducted for personnel in the Startup Administrative Program and the Quality Assurance (QA) Program.

14.2.3 Test Procedures

Prerequisite and preoperational/acceptance test procedures are prepared for use during the initial test program in accordance with the STPEGS Startup Manual. Initial startup test procedures are prepared for use in accordance with the Plant Procedures Manual described in Chapter 13. Each test procedure is prepared using pertinent reference material provided by the appropriate design and vendor organizations, the Updated Final Safety Analysis Report (UFSAR), the Technical Specifications, and the applicable RGs. The development, review, and approval of individual procedures associated with each phase of the initial plant test program are summarized as follows.

<u>Prerequisite Testing</u>

Prerequisite tests, as discussed in Section 14.2.1.1, are performed in accordance with approved, written procedures. These procedures are written by individuals designated by the HL&P

(historical context) Startup Organization. Such procedures are reviewed by QA and reviewed and approved by the Startup Manager to ensure compliance with the HL&P (historical context) QA Program.

Preoperational Testing

Preoperational tests, as discussed above in Section 14.2.1.2, are performed in accordance with approved written procedures. These procedures are written by individuals designated by the HL&P (historical context) Startup Organization. Such procedures are reviewed by the appropriate Startup Supervisors and QA, reviewed and recommended for approval by the JTG, and approved by the HL&P (historical context) Startup Manager.

Acceptance Testing

Acceptance tests, as discussed in Section 14.2.1.2, are performed in accordance with approved written procedures. These procedures are written by individuals designated by the HL&P (historical context) Startup Organization. These procedures are reviewed by the appropriate Startup Supervisor and approved by the Startup Manager.

Initial Startup Testing

Initial startup tests, as discussed in Section 14.2.1.3, are performed in accordance with approved, written procedures. These procedures are written by individuals designated by the NOD. Such procedures are reviewed and approved, as appropriate, by:

1. Plant Operations Manager

2. Plant Engineering Manager

3. Plant Operations Review Committee

4. Plant Manager

Low power and power ascension test procedures to be used in the Unit 1 initial startup test program will be reviewed by the NSSS vendor prior to use.

14.2.3.1 Test Procedure Format. Specific guidelines to be followed in preparing prerequisite and preoperational/acceptance test procedures are addressed in the STPEGS Startup Manual. Specific guidelines to be followed in preparing initial startup test procedures are detailed in the Plant Procedures Manual. These procedures contain the following information as applicable:

1. Purpose and Scope - A clear and concise statement of the purpose of the test.

2. Acceptance criteria - A clear identification of acceptable standards against which the success or failure of the test may be judged.

3. References - Reference sources used to prepare the test.

4. Prerequisites - Conditions and special requirements, if any, that must be satisfied prior to conducting the test.

5. Initial conditions - Those conditions that must be satisfied just prior to testing; includes a listing of required test equipment.

6. Precautions and Notes - Those precautions to be observed during the procedural portion of the test and any general notes relating to the conduct of the test.

7. Procedure - The individual steps in the test sequence, including a method for documenting test data.

8. Restoration - Restores the system to a normal or specified status.

9. Supporting material - Appendices, tables, figures, checkoff lists, data sheets, etc. to be included as necessary.

10. Attachments - Attachments generated during test performance to be identified and attached to the official test copy for retention as plant records.

14.2.4 Conduct of the Test Program

14.2.4.1 Test Program Administrative Controls. The initial plant test program for the STPEGS is divided into three major categories.

Prerequisite testing consists of components tests and system flushing. During prerequisite testing, test procedures are reviewed by QA and reviewed and approved by the Startup Manager. Safety-related test results are reviewed by QA and reviewed and approved by Level III startup personnel. Nonsafety-related test results are reviewed and approved by Level III startup personnel.

Preoperational test procedures are reviewed by the appropriate Startup Supervisor. Following this review, the preoperational test procedure is reviewed by QA and the JTG, and a meeting of the JTG is scheduled by the Startup Manager. That group reviews the procedure and either recommends changes or submits the procedure to the Startup Manager with its recommendation for approval. The Startup Manager approves the preoperational test procedures. Following completion of the preoperational test, a test report is prepared. The test report, accompanied by the completed test procedure, is reviewed and approved in the same manner as the test procedure. Acceptance test procedures are reviewed by the appropriate Startup Supervisor and approved by the Startup Manager.

Initial Startup testing consists of those tests that verify the nuclear design of the reactor core and the thermal capability of the RCS and the Steam and Power Conversion Systems. Initial startup test procedures are reviewed by the Reactor Support Manager. When it is determined that the procedure is adequate to fulfill the requirement of the test summary (see Section 14.2.12) and other applicable documents, the PORC reviews the procedure and either recommends changes or sends it to the Plant Manager with a recommendation for approval. The Plant Manager or his representative approves the startup test procedures. Following completion of an initial startup test, the results of the completed test procedure are reviewed and evaluated by the Reactor Support Manager. Results of the initial startup test program are approved by the Plant Manager prior to progressing with the power ascension phase of the initial startup testing program. As a minimum, hold points are established at approximately 30 percent, 50 percent, and 75 percent power.

During the transition between preoperational and initial startup testing, continuity is maintained between the Startup Group and the NPOD through the following administrative controls:

1. The NPOD Representative or member of the JTG provides the interface between NPOD and the Startup Organization. The Plant Operations Manager is responsible for the coordination of NPOD activities in support of the startup efforts.

2. Administrative control of systems, subsystems, or equipment is transferred between the Startup Group and the NPOD by use of a documented transfer.

3. Prior to initial fuel loading and the commencement of initial startup testing, a comprehensive review of preoperational tests is conducted to provide assurance that the required plant systems and structures are capable of supporting the initial fuel loading and subsequent startup testing.

4. NPOD administrative and operating procedures for the STPEGS are utilized, as appropriate, by the Startup Organization.

14.2.4.2 Sign-Off Provisions. For prerequisite tests, each approved test procedure contains the appropriate data sheets for sign-off of completed tests. Certain specific prerequisite test procedures will contain procedural steps for sign-off. The person conducting the test is responsible for ensuring the data sheets are properly completed and signed off.

For preoperational/acceptance and initial startup tests, each approved test procedure contains the appropriate sign-off provisions for the prerequisite and procedural steps as required to control test performance and the sequence of testing. The Startup Engineer will verify that test prerequisites have been met for preoperational/acceptance tests. The Test Director and the Shift Supervisor verify that the test prerequisites have been met for initial startup tests. The Startup Engineer/Test Director is responsible for initialing the appropriate space in the test procedure to indicate completion of the procedural steps.

14.2.4.3 Maintenance/Modification Procedures. A work request is used to initiate corrective maintenance to systems that have been released to the Startup Organization. The work request form assigns responsibility for performing the work and identifies retest requirements. When the corrective maintenance and/or modifications have been completed, the signed off work request form is returned to the Startup Organization so that any retest requirements may be met. Results of retest due to maintenance and results of retest due to modifications are reviewed and approved in the same manner as those for the original tests.

14.2.4.4 Test Performance. For each prerequisite or acceptance test, the organization responsible for performing the test designates a qualified person to conduct the test. For each preoperational or initial startup test, the organization responsible for performing the test designates a qualified person to conduct the test. During the performance of a prerequisite, preoperational/ acceptance, or initial startup test, the official copy of the test procedure is available in the test area. The person conducting the test is charged with overall responsibility for performing the test in accordance with the approved test procedure. If, during the performance of the test, it is determined that it cannot be conducted as written, it is the responsibility of the person conducting the test to suspend testing until the procedure has been modified and approved.

Modifications to preoperational/acceptance test procedures are accomplished by a Test Change Notice.

Initial startup test procedure revisions will be approved in accordance with Section 6.0 of the STPEGS Technical Specifications.

14.2.5 Review, Evaluation, and Approval of Test Results

Individual test results for each testing phase are reviewed to ensure that the test has been performed in accordance with the written, approved procedure and that all required data, checks, and signatures have been properly recorded and that system or component performance meets the approved acceptance criteria. The specific acceptance criteria for determining the success or failure of the test are included as part of the procedure and are used by the reviewer in reviewing the test results.

Completed prerequisite test data sheets are reviewed and approved by appropriate Level III Startup personnel, and safety-related test results are reviewed by QA.

Completed acceptance test procedures and data sheets are reviewed by the appropriate startup personnel, and approved by the Startup Manager.

Completed preoperational test procedures and test reports are reviewed for conformance with testing requirements and for acceptance of the test results. Following this review, the procedures and test reports are submitted to QA for review, and to the JTG for final review, evaluation, and approval recommendation to the Startup Manager.

Completed initial startup test procedures are reviewed by the Reactor Support Manager for conformance with testing requirements and for acceptance of the test results. Following this review, the procedures are submitted to the Plant Engineering Manager for review and evaluation. The Plant Manager approves the escalation of power to the next testing plateau pending satisfactory completion of required testing at the respective power levels.

If the as-built configuration of a system cannot demonstrate its ability to meet the acceptance criteria, a nonconformance document is prepared. See Section 17.2.15 for a discussion of nonconformance requirements.

Test results for each phase of the initial plant test program are reviewed and verified as complete (as required) and satisfactory before testing in the next phase is started. Preoperational/acceptance testing on a system is not normally started until applicable prerequisite tests have been completed, reviewed, and approved.

It is intended that the prerequisite and preoperational/acceptance testing be completed prior to commencing initial fuel loading. Any testing identified which has not been completed is reviewed by the JTG and PORC. Technical justification for not completing any preoperational testing and a schedule, including power level for completion of testing, will be provided at that time.

The initial startup testing phase of the test program is subdivided into the following categories: initial fuel load, precritical testing, initial criticality and low-power physics testing, and power ascension testing. It ends with the plant at 100 percent power. Each subdivision is a prerequisite which must be completed, reviewed, and approved before tests in the next category are started. Power ascension tests are scheduled and conducted at predetermined power levels. The safety of the plant is not totally dependent upon the performance of untested systems during the initial startup test program. Insofar as is practicable, the 25-percent-power level will not be exceeded without having tested systems which are relied upon to prevent, to limit, or to mitigate the consequences of postulated accidents; however, testing on some of these systems will not be completed prior to exceeding 25 percent power. The testing plateaus to be used for STPEGS initial startup testing are at 30, 50, 75, 90 (Unit 1 only), and 100 percent of rated power and are accomplished in ascending order of power level.

The plateaus for the power ascension testing are indicated in each test summary. Results from each test conducted at a given plateau are evaluated prior to proceeding to the next level. For those tests which result in a plant transient, for which a realistic plant transient performance analysis has been performed, the test results are compared to the results of the realistic transient analysis rather than the results of the transient analysis based upon accident analysis assumptions.

Following completion of testing at 100 percent of rated power, all final test results are reviewed, evaluated, and approved.

14.2.6 Test Records

A single copy of each test procedure is designated and identified to be used for test documentation. The test procedure and all information specifically called for in that procedure, such as completed data sheets, tables, logs, chart recordings etc., are included with the test package as applicable. All completed test packages become a part of the plant's historical record and are maintained at the facility in accordance with HL&P's administrative procedures and requirements for record retention.

14.2.7 Conformance of Test Program with Regulatory Guides

The initial plant test program for STPEGS Units 1 and 2 has been developed with the intent of demonstrating that the plant can be operated in accordance with design requirements and in a manner that will not endanger the health and safety of the public. To this end, the graded approach defined by RG 1.68 is complied with as detailed throughout this chapter. Appendices to RG 1.68 were utilized as references in the preparation of the test summaries in Section 14.2.12.

The test program as defined in Section 14.2.12.2 is intended to conform to the appendices of RG 1.68 and the guides referenced therein as described in Table 3.12-1. Table 3.12-1 provides justification for exceptions taken.

14.2.8 Utilization of Reactor Operating and Testing Experiences in Development of the Test Program

The procedure for feedback of operating information is in accordance with NUREG-0737, item I.C.5, and includes reviews of operating and testing experiences at other reactors. These reviews are to be completed in sufficient time to permit the findings to be incorporated into the startup test program.

These reviews include at least the previous two-year period of operating and testing experiences prior to initial fuel loadings.

The STPEGS startup organization is staffed by HL&P (historical context), BEC, and Westinghouse personnel and other consultants as required. Personnel on this staff who are assigned to key positions have previous testing and/or operational experience. In addition, the Engineer, the constructor, the NSSS supplier, and other vendors provide input to the Startup Organization on problem areas noted at similar power plants.

14.2.9 Trial Use of Plant Procedures

One major objective of the initial plant test program is to trial-use plant procedures. Therefore, whenever practicable, plant procedures are used during the initial plant test program.

Plant procedures are prepared by NPOD personnel with the assistance of others, where required. The procedures are trial-use-tested, to the extent practicable, by the NPOD during the performance of the initial plant test program.

The plant procedures that may be used in the initial plant test program are instrumentation and control procedures, maintenance procedures, operating procedures, emergency procedures, chemistry procedures, and radiation protection procedures. The schedule for developing these plant procedures is discussed in Chapter 13.

14.2.10 Initial Fuel Loading and Initial Criticality

Fuel loading begins when all prerequisite system tests and operations are satisfactorily completed and the NRC operating license received. Upon completion of fuel loading, the reactor upper internals and pressure vessel head are installed and additional mechanical and electrical tests performed prior to initial criticality. After final precritical tests are completed, initial operation of the reactor begins.

14.2.10.1 Initial Fuel Loading. The overall responsibility and direction of the initial core loading is exercised by the Plant Manager or his representative. The process of initial core loading is directed from the operating floor of the Containment structure. Procedures for the control of personnel access and the maintenance of Containment security are implemented prior to commencing loading operations. The composition, duties, and emergency responsibilities of the fuel handling crew are specified. The Reactor Containment structure is completed and the Containment integrity established prior to commencing loading operations. Radiation monitors, nuclear instrumentation, manual initiation, and other devices to actuate building evacuation alarm and ventilation control are tested and operating.

Fuel handling tools and equipment will have been checked and dry runs conducted in their use and operation. Inspection of fuel, control rods, and burnable poison assemblies is complete.

The status of the reactor vessel and associated components is specified to ensure that they are in a state of readiness to receive fuel. Water level is maintained above the bottom of the nozzles, and reactor coolant recirculation is established to maintain a uniform boron concentration.

The initial core configuration is specified as part of the core design studies. In the event mechanical damage is sustained, during core-loading operations, to a fuel assembly of a type for which no spare is available onsite, core-loading operations are suspended until an alternate core-loading scheme, whose characteristics closely approximate those of the initially prescribed pattern, has been determined.

The core is assembled in the reactor vessel, submerged in water containing enough dissolved boric acid to maintain a calculated core effective multiplication factor of ≤0.95. The refueling cavity is dry during initial core loading. Core moderator chemistry conditions are verified by chemical analysis of moderator samples taken at routine intervals.

Core-loading instrumentation consists of two permanently installed source-range channels and two temporary incore source-range channels. A response check of nuclear instruments to a neutron source is made within 8 hours prior to loading (or resumption of loading, if delayed for 8 hours or more). The permanent channels are monitored in the main control room by licensed station operators; the temporary channels are installed in the Containment structure and monitored by qualified engineering personnel and licensed station operators. At least one permanent channel is equipped with an audible count-rate indicator. Both permanent channels have the capability of displaying the neutron flux level on a strip chart recorder. The temporary channels indicate on count-rate meters with a minimum of one channel recorded on a strip chart recorder. Minimum count rates of one-half count per second, attributable to core neutrons, are required on at least two of the four available source-range channels at all times following installation of the initial nucleus of eight fuel assemblies.

An initial nucleus of eight fuel assemblies, the first of which contains an activated 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} ≤0.90) under the required conditions of loading.

At least two artificial neutron sources are introduced into the core at specified points in the core-loading program to ensure a minimum count rate of one-half count per second for adequate monitoring of the core.

Fuel assemblies are placed in the reactor vessel one at a time in accordance with a previously established and approved sequence developed to provide reliable core monitoring. The core-loading procedure documents include detailed tabular check sheets which prescribe and verify the successive movements of each fuel assembly and its specified inserts from its initial position in the storage 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 substitutions of components. A fuel assembly status board is maintained in the main control room throughout the core loading operation.

Each subsequent fuel addition is accompanied by detailed neutron count-rate monitoring to determine that the just-loaded fuel assembly does not excessively increase the count rate and that the extrapolated inverse count-rate ratio is not decreasing for unexplained reasons. The results of each loading step are evaluated before the next prescribed step is started.

Criteria for safe loading require that loading operations stop immediately if:

1. An unanticipated increase in the neutron count rates by a factor of 2 occurs on all responding source-range channels during any single loading step after the initial nucleus of eight fuel assemblies is loaded (excluding anticipated change due to detector and/or source movement).

2. The neutron count rate on any individual source-range channel increases by a factor of 5 during any single loading step after the initial nucleus of eight fuel assemblies is loaded (excluding anticipated changes due to detector and/or source movements).

3. A decrease in boron concentration greater than 20 ppm is determined from two successive samples of RCS water until the decrease is explained.

An alarm in the Containment and main control room is coupled to the source-range channels with a setpoint at five times the current count-rate. This alarm automatically alerts the loading operation personnel of high count-rate and requires an immediate stop of the loading operations until the situation is evaluated. In the event the alarm is actuated during core loading, and after it has been determined that no hazards to personnel exist, preselected personnel are permitted to reenter the Containment to evaluate the cause and determine future action.

Core loading procedures specify the condition of fluid systems to prevent inadvertent dilution of the reactor coolant, the movement of fuel to preclude the possibility of mechanical damage, and the conditions under which loading can proceed.

14.2.10.2 Initial Criticality. The approach to initial criticality is conducted according to approved written procedures which specify the plant conditions, safety and precautionary measures, and specific instructions. The procedures also delineate the chains of responsibility and authority in effect during this period of operation.

Alignment of the fluid systems are specified to provide controlled "start" and "stop" as well as adjustments of the rate of approach to criticality. Initial criticality is achieved by shutdown and control bank withdrawal and RCS boron concentration reduction. Criticality predictions for boron concentration and control rod position are provided, and criteria and actions to be taken in the event actual plant conditions deviate from predicted values are established.

Nuclear instruments used in monitoring the initial criticality are calibrated. A neutron count-rate of at least 1/2-count per second registers on the startup channels before startup begins, and the signal-to-noise ratio will be known to be greater than 2. The systems required for startup or protection of the plant are operable and ready prior to initial criticality.

Inverse count-rate ratio monitoring, using data from the normal plant source-range instrumentation, is used as an indication of the proximity and rate of approach to criticality. Inverse count-rate ratio data are plotted as a function of rod bank position during rod motion, and as a function of primary water addition during RCS boron concentration reduction.

Initially, the shutdown and control banks of control rods are withdrawn using the same withdrawal sequences and patterns used during subsequent startups, leaving the last withdrawn control bank inserted far enough into the core to provide effective control when criticality is achieved.

The boron concentration in the RCS is then reduced by the addition of primary water. Criticality is expected to be achieved during boron dilution. Rod withdrawal or dilution during approach to criticality is suspended if abnormal tracking of count-rates is observed. Withdrawal of rods or dilution may be resumed when the source of the abnormality is understood and known not to jeopardize plant safety.

Throughout this period, samples of the primary coolant are obtained and analyzed for boron concentration. Written procedures specify plant conditions, precautions, and specific instructions for the approach to criticality.

Successive stages of control rod assembly group withdrawal and of boron concentration reduction are monitored by observing changes in neutron count rate, as indicated by the permanent source-range nuclear instrumentation, as functions of group position during rod motion, reactor coolant boron concentration, and primary water addition to the RCS during dilution. Throughout this period, samples of the primary coolant are obtained and analyzed for boron concentration.

Inverse count-rate ratio monitoring is used as an indication of the proximity and rate of approach to criticality during control rod assembly withdrawal and during reactor coolant boron dilution. A cautious approach to criticality is conducted to prevent passing through criticality on a period shorter than approximately 30 seconds (less than one decade per minute).

14.2.11 Test Program Schedule

14.2.11.1 Relationship of Each Major Phase of the Test Program to Fuel Load Dates. The initial plant test program for STPEGS Units 1 and 2 has been scheduled utilizing a computerized critical path method (CPM) scheduling technique. The startup schedule indicates preoperational testing commences 18 months prior to the fuel load date. The actual loading of fuel is scheduled to be completed in 10 days. The low power tests are planned to be completed in 30 days, and the power ascension tests are scheduled to be completed 16 weeks following the completion of the low power tests.

14.2.11.2 Overlap of Unit 1 Test Program with Unit 2 Test Program. The project schedule indicates that the Unit 2 fuel load date is approximately 18 months later than that for Unit 1. Accordingly, the startup schedule indicates that very little prerequisite testing for Unit 2 will have occurred prior to completion of the power ascension testing for Unit 1. Unit 1 will be given top priority should any additional personnel be required for initial startup testing. These personnel report to the Startup Manager but technically report to the Reactor Support Manager. During the period of overlap, startup personnel will be allowed to work on both units. Refer to Sections 13.1.2, 13.5, 14.2.2, and 14.2.4.1 for the organizational structure and administrative controls involved.

14.2.11.3 Effect of System Dependencies on Test Program Schedule. The initial plant test program has been organized such that the required support systems are tested prior to commencing the testing on a particular system. This plan has been used as a basis for the development of the CPM startup schedule, which is continuously updated throughout the test program.

14.2.11.4 Tests Which Must Be Completed Prior to Fuel Load. Various system tests must be completed prior to fuel load. These tests are identified in the CPM startup schedule, which is updated periodically.

14.2.11.5 Test Procedure Preparation Schedule as Related to System Testing. The preparation of test procedures for a particular system is scheduled to support the test performance schedule. Staffing of the Startup Organization is scheduled to provide for individual procedure preparation to be initiated at the earliest practicable date consistent with the availability of approved reference information.

It is planned to have preoperational and initial startup test procedures available for examination by interested parties approximately 60 days prior to their scheduled use in the field, and not less than 60 days prior to fuel load. Acceptance test procedures will be available prior to conduct of the test.

14.2.12 Individual Test Descriptions

The initial plant test program is separated into three distinct phases to provide an efficient, comprehensive, and manageable program.

14.2.12.1 Prerequisite Testing. Prerequisite testing includes requirements for verification and/or completion of various construction-related activities which should normally be completed prior to performing preoperational/acceptance tests.

The type and extent of prerequisite testing on an individual system, as well as the responsibility for completing such tests, is specified by the HL&P (historical context) Startup Organization. Prerequisite tests are conducted to verify equipment fabrication, installation, cleanliness, integrity, continuity, and operation.

14.2.12.2 Preoperational/Acceptance Testing. Preoperational/acceptance testing includes requirements for completion of various preoperational test procedures to verify the functional and operational capabilities of systems prior to the initial fuel loading.

The systems testing summaries provided include summaries for acceptance testing on nonsafety-related systems. The intent of the program is to follow the graded approach to testing as outlined in RG 1.68 and its appendices. The system acceptance testing summaries are included only to provide test overview. Acceptance test procedures will differ from preoperational tests in format and the review process.

The system testing expected to be performed is listed below. Specific, detailed objectives, acceptance criteria, and prerequisites are included in each preoperational/acceptance test procedures.

The preoperational/acceptance system testing summarized in the remainder of this section is listed as follows:

1. 345 kV Switchyard Acceptance Test Summary

2. Unit Standby Transformer Preoperational Test Summary

3. 13.8 kV Auxiliary and Standby Busses Preoperational Test Summary

4. Essential AC Lighting System Acceptance Test Summary

4a. Plant Emergency (DC) Lighting Acceptance Test Summary

5. 125 vdc Balance-of-Plant (BOP) 1A and 1B Battery Chargers Acceptance Test Summary

6. 125 vdc BOP Battery and Bus Acceptance Test Summary

7. 4.16 kV BOP Switchgear Acceptance Test Summary

8. 480 V BOP Switchgear Acceptance Test Summary

9. 480 V BOP Motor Control Centers Acceptance Test Summary

10. BOP Inverter Acceptance Test Summary

11. 120 vac BOP Vital Acceptance Test Summary

12. 250 vdc BOP Battery Chargers Acceptance Test Summary

13. 250 vdc BOP Battery and Bus Acceptance Test Summary

14. Main and Unit Auxiliary Transformer Preoperational Test Summary

15. River Service Transformer and Switchgear Acceptance Test Summary (Not Used)

16. 13.8 kV Emergency Transformer Acceptance Test Summary

17. 13.8 kV Emergency Bus Acceptance Test Summary

18. Heat Tracing System Preoperational Test Summary (Not Used)

19. Communications Page and Warning System Preoperational Test Summary

20. Channels I, II, III, and IV 125 vdc, Class 1E Battery Chargers Preoperational Test Procedure Summary

21. 125 vdc Battery and Bus Channels I, II, III, and IV Preoperational Test Summary

22. Class 1E AC Power Distribution Preoperational Test Summary

23. 480 V Class 1E Switchgear Preoperational Test Summary (Integrated into Test Summary 22)

24. 480 V Class 1E Motor Control Center Preoperational Test Summary (Integrated into Test Summary 22)

25. 120 vac 1E Power Source Channels I, II, III, and IV Preoperational Test Summary

26. 120 vac, Class 1E Bus, Channels I, II, III, and IV Preoperational Test Summary

27. Containment Heating, Ventilating, and Air-Conditioning (HVAC) Penetration Space Exhaust Subsystem Preoperational Test Summary

28. Containment HVAC Normal and Supplementary Purge Subsystem Preoperational Test Summary

29. Containment HVAC Reactor Containment Fan Cooler (RCFC) System Preoperational Test Summary

30. Containment HVAC Control Rod Drive Mechanism (CRDM) Ventilation Subsystem Acceptance Test Summary

31. Containment HVAC Isolation Valve Cubicle (IVC) Subsystem Preoperational Test Summary

31a. Containment HVAC Isolation Valve Cubicle Subsystem Acceptance Test Summary

32. Mechanical Auxiliary Building (MAB) HVAC Preoperational Test Summary

32a. Mechanical Auxiliary Building HVAC Acceptance Test Summary

33. Electrical Auxiliary Building (EAB) HVAC System Preoperational Test Summary

34. Diesel Generator Building (DGB) HVAC Preoperational Test Summary

35. Fuel Handling Building (FHB) HVAC System Preoperational Test Summary

36. Essential Cooling Water (ECW) Building HVAC System Preoperational Test Summary

37. Annunciator System Acceptance Test Summary (Not Used)

38. Main Turbine Acceptance Test Summary

39. Main Generator Acceptance Test Summary

40. Electro-hydraulic Control (EHC) System Acceptance Test Summary

41. Containment Hydrogen Monitor Preoperational Test Summary

42. Solid-State Protection System (SSPS) Preoperational Test Summary

43. Engineered Safety Features Actuation System (ESFAS) Trains A, B, and C Preoperational Test Summary

44. Reactor Coolant Pressure Boundary (RCPB) Leakage Detection System Preoperational Test Summary

45. Nuclear Instrumentation System (NIS) Preoperational Test Summary

46. Incore Monitoring Instrumentation System Acceptance Test Summary

47. Control and Rod Drive System Preoperational Test Summary

48. Boron Concentration Measurement System Acceptance Test Summary (Not Used)
49. Digital Rod Position Indication System Preoperational Test Summary
50. Process and Area Radiation Monitoring System (RMS) Preoperational Test Summary
51. Fire Protection System (Water Subsystem) Preoperational Test Summary
52. Fire Protection System (Foam Subsystem) Preoperational Test Summary
53. BOP Sampling System Acceptance Test Summary
54. Condenser Gas Removal System Acceptance Test Summary
55. Main Turbine Lube Oil System Acceptance Test Summary
56. Steam Generator Feed Pump and Turbine Lube Oil System Acceptance Test Summary
57. Main Turbine Gland Steam System Acceptance Test Summary
58. Feed Pump Turbine (FPT) and FPT Gland Steam Acceptance Test Summary
59. Isophase Bus Cooling System Acceptance Test Summary
60. H_2 Seal Oil System Acceptance Test Summary
61. Stator Cooling Water System Acceptance Test Summary
62. Primary Sampling System Preoperational Test Summary
63. Auxiliary Steam Acceptance Test Summary
64. Condensate System Acceptance Test Summary
65. Main Feedwater (FW) System Preoperational Test Summary

65a. Main Feedwater System Acceptance Test Summary

66. Condensate Polisher System Acceptance Test Summary
67. Open Auxiliary Cooling Water System Acceptance Test Summary
68. Circulating Water System Acceptance Test Summary
69. Closed Loop Auxiliary Cooling Water System Acceptance Test Summary
70. Essential Cooling Pond (ECP) Makeup Station Acceptance Test Summary

71. Instrument Air System Acceptance Test Summary

72. BOP Chemical Feed System Acceptance Test Summary

73. Reactor Coolant System (RCS) Hydrostatic Test Summary (Included in the Preoperational Test Program)

74. Incore Thermocouple and Resistance Temperature Detector (RTD) Cross-Calibration Preoperational Test Summary

75. Pressurizer Relief Tank (PRT) Preoperational Test Summary

76. Safety Injection System (SIS) Trains A, B, and C Preoperational Test Summary

77. Thermal Expansion and Vibration (Steady State/Transient)

78. Residual Heat Removal System (RHRS) Preoperational Test Summary

79. Containment Spray System (CSS) Preoperational Test Summary

80. Chemical and Volume Control System (CVCS) Preoperational Test Summary

81. Standby Diesel Generator (SBDG) Preoperational Test Summary

82. Boron Recycle System (BRS) Preoperational Test Summary

83. Emergency Boration System (EBS) Preoperational Test Summary (Not Used)

84. Main Steam (MS) System Preoperational Test Summary

85. Auxiliary Feed Water System (AFWS) Preoperational Test Summary

86. Fuel Handling Equipment Preoperational Test Summary

87. Spent Fuel Pool Cooling System Preoperational Test Summary

88. Essential Cooling Water System (ECWS) Preoperational Test Summary

89. Component Cooling Water System (CCWS) Preoperational Test Summary

90. Nuclear N_2 and H_2 System Acceptance Test Summary

91. Gaseous Radwaste System Preoperational Test Summary

92. Containment Isolation Preoperational Test Summary

93. Containment Integrated Leak Rate Test Summary (Included in the Preoperational Test Program)

94. Radioactive Equipment and Floor Drain Sump System Preoperational Test Summary

95. Solid Radioactive Waste Preoperational Test Summary

96. Liquid Radwaste (Recycle Portion) Preoperational Test Summary

97. Liquid Radwaste (Waste Portion) Preoperational Test Summary

98. Reactor Coolant System Hot Functional Preoperational Test Summary

99. Reactor Coolant System Thermal Expansion and Restraint Preoperational Test Summary (Not Used)

100. Power Conversion System Thermal Expansion Preoperational Test Summary (Not Used)

101. Operational Vibration Preoperational Test Summary (Not Used)

102. Seismic Monitoring System Acceptance Test Summary

103. Combustible Gas Control System Preoperational Test Summary

104. Personnel Monitoring and Survey Instrumentation Preoperational Test Summary (Not Used)

105. Plant Process Computer Acceptance Test Summary

106. Time Response Preoperational Test Summary

107. Reactor Trip Breaker Preoperational Test Summary

108. Reactor Makeup Water (RMW) System Preoperational Test Summary

109. Emergency Response Facility Data Acquisition and Display System (ERFDADS) Preoperational Test Summary

110. ERFDADS Computer Acceptance Test Summary

111. Qualified Display Processing System (QDPS) Preoperational Test Summary

112. Reactor Vessel Level Indicating System (RVLIS) Preoperational Test Summary

113. Loose Parts Monitoring System Acceptance Test Summary

1. <u>345 kV Switchyard Acceptance Test Summary</u>

   a. Test Objective - To demonstrate that the 345 kV switchyard is capable of providing a highly reliable source of offsite power.

b. Acceptance Criteria - The switchyard protective relaying and power circuit breakers function to protect the integrity of the north and south busses during switching and fault-clearing operations.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required component tests have been completed.

3) Sufficient lines have been installed and energized to allow continued operation of the unit during switchyard testing.

d. Method - By simulation and manual operation of breaker controls, verify the operation of the following relay schemes:

1) Bus differential

2) Breaker failure

3) Line and bus fault clearing

2. <u>Unit Standby Transformers Preoperational Test Summary</u>

a. Test Objective - To demonstrate that Transformers No. 1 and No. 2 are capable of supplying the necessary power to their assigned unit during normal plant startup or shutdown.

The capability of either Standby Transformer to supply all Engineered Safety Features (ESF) loads in both units will also be verified.

b. Acceptance Criteria

1) Standby Transformer(s) maintain the steady-state bus voltage within design limits, per Section 8.3.

2) Each Standby Transformer can be connected to any 13.8 kV Standby Bus in either unit, per Section 8.3.

3) Each Standby Transformer is capable of supplying the ESF loads of either or both units without voltage degradation that precludes ESF component operation, per Section 8.3.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) The required component tests have been completed.

3) Approved logic, wiring diagrams, and vendors' technical data are available.

d. Method

1) Simulate, where required, protection feature operation and verify alarms and interlock response.

2) Align Standby Transformer No. 2 to Unit 1, simulate a MODE I (Safety Injection Actuation) in Unit 1; verify transformer capability to start and supply ESF loads in Unit 1.

3) Align Standby Transformer No. 1 to Unit 1, simulate a MODE I in Unit 1, and verify transformer capability to start and supply ESF loads in Unit 1.

4) Transfer Unit 1 normal loads to Standby Transformer No. 2.

5) With an equivalent Unit 2 ESF load connected to Standby Transformer No. 2, simulate a MODE I in Unit 1, and verify transformer capability to start and supply ESF loads in Unit 1.

3. <u>13.8 kV Auxiliary and Standby Busses Preoperational Test Summary</u>

a. Test Objective - To demonstrate that each of the 13.8kV Auxiliary and Standby busses can be energized from, and transferred between, each of the designed power sources (Standby No. 1, Standby No. 2, or Unit 1 Auxiliary Transformer).

b. Acceptance Criteria

1) The 13.8 kV busses can be energized from either Standby No.1, Standby No. 2, or Unit 1 Auxiliary Transformers, per Section 8.3.

2) The 13.8 kV busses can be manually transferred between the above power sources without loss of bus voltage, per Section 8.3.

3) Interlocks function to preclude extended parallel operation of the above power sources, per Section 8.3.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Required component tests have been completed.

3) Approved logic, wiring diagrams, and vendors' technical data are available.

d. Method

1) Energize each of the 13.8 kV busses from the Standby No. 1 and No. 2 Transformers.

2) Manually transfer each of the 13.8 kV busses between the Standby Transformers and verify no loss of bus voltage occurs.

3) Verify that prolonged parallel operation of the Standby Transformers results in alarm and subsequent selective tripping of one of the sources.

4) With plant loads in operation, verify the bus steady-state voltage level remains within design limits.

5) Verify the 13.8 kV busses are capable of distributing adequate power to the ESF Class 1E power system during normal and MODE I (Safety Injection Actuation) operation.

4. Essential AC Lighting System Acceptance Test Summary

a. Test Objective - To verify the performance of the Essential AC Plant Lighting System and the backup Diesel Generator (DG) power source.

b. Acceptance Criteria

1) The illumination level in those area supplied by Essential AC Lighting System meets the design requirement, per Section 9.5.3.

2) The backup non-Class 1E DG power sources reestablish power to the Essential AC Plant Lighting System following a loss of the offsite power (LOOP) source, per Section 9.5.3.

3) The backup Class 1E DG power sources reestablish power to the Essential AC Plant Lighting System following a LOOP source per Section 9.5.3.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Required component tests have been completed.

3) Approved wiring diagrams, logic diagrams, and vendors' technical data are available.

d. Method

1) Verify illumination level in those areas supplied by the Essential AC Lighting System with the normal power source(s) energized.

2) Deenergize the normal power source(s) from the non-Class 1E 480 vac busses.

3) Verify that the Essential AC Plant Lighting System power is reestablished by backup non-Class 1E DG source and Class 1E DG source.

4a. Plant Emergency Lighting (DC) Acceptance Test Summary

a. Test Objective - To verify the performance of the Plant Emergency (DC) Lighting System.

b. Acceptance Criteria

1) Emergency area lighting provides sufficient illumination to allow personnel safe egress following the loss of area normal (AC) lighting, per Section 9.5.3.

2) Sufficient illumination is provided in all areas where required for control of safety-related equipment, as well as access to and from those areas, per Section 9.5.3.

3) Plant Emergency (DC) lighting is available for a minimum of the nameplate rating of the units, per Section 9.5.3.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Required component tests have been completed.

3) Approved wiring diagrams, logic diagrams, and vendors' technical data are available.

d. Method - Deenergize the normal/essential (AC) lighting by area, and verify the operation of the Emergency (DC) Lighting System.

5. 125 vdc Balance-of-Plant 1A and 1B Battery Chargers Acceptance Test Summary

a. Test Objective - To ensure that the 125 vdc balance-of-plant (BOP) battery chargers function as designed to provide a reliable source of DC power to the battery and its associated loads.

b. Acceptance Criteria

1) Verify that each battery charger functions as designed to provide 125 vdc power to charge its associated battery from design minimum charge to its fully charged state within 12 hours while still supplying its normal steady-state loads.

2) Verify that the output voltage is within the required tolerance of its nominal output voltage.

3) Verify that the output voltage is adjustable over the span specified for the equalize and float voltages.

4) Verify that the DC output ripple is within acceptable limits.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) The batteries are installed and complete.

3) All normally connected loads or equivalent loads are available.

4) Electrical power is available to operate the system.

5) Approved wiring diagrams, logic diagrams, and vendors' technical data are available.

d. Method

1) With the battery charger fully loaded, verify that the DC output voltage parameters are within specifications.

2) Verify that the DC output voltage can be varied as specified in all modes of operation.

3) Verify that the voltage regulation is within specifications by measuring the output voltage variation from no load to full load.

6. <u>125 vdc BOP Battery and Bus Acceptance Test Summary</u>

a. Test Objective - To ensure that the 125 vdc BOP battery and bus provide a reliable source of 125 vdc power for safe shutdown of the Turbine Generator System and other critical BOP systems during loss of AC power to the battery chargers.

b. Acceptance Criteria

1) The 125 vdc battery shall be capable of supplying its connected loads during loss of AC power to the battery chargers, for the required amount of time.

2) The 125 vdc distribution system shall be capable of distributing 125 vdc power to its connected loads.

3) The 125 vdc distribution system shall provide protection for its connected loads and bus.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required electrical tests are complete.

3) The batteries are charged.

4) Approved wiring diagrams and vendors' technical data are available.

d. Method

1) With the battery fully charged, deenergize the charger and verify that the battery supplies its associated loads for the required amount of time.

2) Connect an appropriate load to each breaker and verify that they trip in the required amount of time.

7. <u>4.16 kV BOP Switchgear Acceptance Test Summary</u>

a. Test Objective - The 4.16 kV BOP switchgear shall function in such a manner as to provide electric power at nominal voltage levels to the loads connected to this bus.

b. Acceptance Criteria

1) Operational loads are within the rating of the switchgear.

2) Interlocks and controls perform their intended function as described in appropriate design documents.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Sufficient load is available to be connected to the busses to demonstrate their operability.

3) Approved piping and instrument diagrams (P&IDs), logic diagrams, wiring diagrams, and vendors' technical data are available.

d. Method

1) Load the bus with sufficient load to verify its ability to perform its intended function without undue thermal or mechanical stresses.

2) Simulate necessary signals to verify correct operation of protective relays and controls.

8. <u>480 V BOP Switchgear Acceptance Test Summary</u>

a. Test Objective - The 480 V BOP switchgear shall function in such a manner as to provide electric power at the correct voltage to the loads connected to the bus.

b. Acceptance Criteria

1) Operational loads are within the rating of the switchgear.

2) Interlocks and controls perform their intended function as described in appropriate design documents.

3) Supply transformers are capable of supplying the necessary power to their respective load centers.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Sufficient load is available to be connected to the buses to demonstrate their operability.

3) Approved P&IDs, logic diagrams, wiring diagrams, and vendors' technical data are available.

d. Method

1) Verify proper operation of the bus protective relaying by simulation.

2) Verify proper operation of the breaker interlocks by simulation.

3) Load the bus with sufficient load to verify its ability to perform its intended function without undue thermal or mechanical stress.

9. <u>480 V BOP Motor Control Centers Acceptance Test Summary</u>

a. Test Objective - The 480 V BOP motor control centers (MCCs) function in such a manner as to provide electric power at the correct voltage to the loads connected to these MCCs.

b. Acceptance Criteria

1) Loads connected to the bus may be operated without undue thermal or mechanical stresses to the switchgear.

2) Interlocks and controls perform their intended function as described in appropriate design documents.

3) Supply transformers are capable of supplying the necessary power to their respective distribution panels.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Sufficient load is available to be connected to the buses to demonstrate their operability.

3) Approved P&IDs, logic diagrams, wiring diagrams, and vendors' technical data are available.

d. Method

1) Verify proper operation of the bus protective relaying by simulation.

2) Verify proper operation of the breaker interlocks by simulation.

3) Load the bus with sufficient load to verify its ability to perform its intended function without undue thermal or mechanical stress.

10. <u>BOP Inverter Acceptance Test Summary</u>

a. Test Objective - To demonstrate that the BOP inverters function as designed to provide an adequate regulated source of AC power to the BOP vital AC.

b. Acceptance Criteria

1) Verify that the inverter functions as designed to supply 115 vac, 60 Hz power to its associated loads.

2) Verify that loss of the normal (AC) input does not cause a perturbance in the AC output.

3) Verify that the output voltage regulation and frequency regulation are as specified.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Electrical power (AC and DC) is available to operate the system.

3) Approved logic diagrams, wiring diagrams, and vendors' technical data are available.

4) An output load is available to fully load the inverter.

d. Method

1) Operate the inverter from zero to 100 percent load and verify that the following meet design:

a) Output voltage

b) Output frequency

2) Trip the AC feeder breaker and verify that the AC output is not interrupted and maintains the bus output voltage and frequency as designed.

11. <u>120 vac BOP Vital Acceptance Test Summary</u>

a. Test Objective - To demonstrate that the 120 vac BOP vital bus is capable of distributing the 120 vac output of its associated inverter to its connected loads in accordance with design requirements.

b. Acceptance Criteria - Power distribution is per the design drawing.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required electrical power supplies are available.

3) Approved wiring diagrams and vendors' technical data are available.

4) Required electrical tests are complete.

d. Method - Energize the distribution panels and verify voltage level at the panel.

12. <u>250 vdc BOP Battery Chargers Acceptance Test Summary</u>

a. Test Objective - To ensure that the 250 vdc BOP battery chargers function as designed to provide a reliable source of DC power to the battery and its associated loads.

b. Acceptance Criteria

1) Verify that each battery charger functions as designed to provide 250 vdc power to charge its associated battery from design minimum charge to its fully charged state within 12 hours while still supplying its normal steady-state loads.

2) Verify that the output voltage is within the required tolerance of its nominal output voltage.

3) Verify that the output voltage is adjustable over the span specified from the equalize and float voltages.

4) Verify that the DC output ripple is within acceptable limits.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) The batteries are installed and complete.

3) All normally connected loads or equivalent loads are available.

4) Electrical power is available to operate the system.

5) Approved wiring diagrams, logic diagrams, and vendors' technical data are available.

d. Method

1) With the battery charger fully loaded, verify that the DC output voltage parameters are within specifications.

2) Verify that the DC output voltage can be varied as specified in all modes of operation.

3) Verify that the voltage regulation is within specifications by measuring the output voltage variation from no load to full load.

13. <u>250 vdc BOP Battery and Bus Acceptance Test Summary</u>

a. Test Objective - The objective of this test is to ensure that the 250 vdc BOP battery and bus provide a reliable source of 250 vdc power for safe shutdown of the Turbine-Generator System and other critical BOP systems during loss of all AC sources.

b. Acceptance Criteria

1) The 250 vdc battery shall be capable of supplying its connected loads during loss of AC power for the required amount of time.

2) The 250 vdc distribution system shall be capable of distributing 250 vdc power to its connected loads.

3) The 250 vdc distribution system shall provide protection for its connected loads and bus.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required electrical tests are complete.

3) The batteries are charged.

4) Approved wiring diagrams and vendors' technical data are available.

d. Method

1) With the battery fully charged, deenergize the charger and verify that the battery supplies its associated loads for the required amount of time.

2) Connect an appropriate load to each breaker and verify that they trip in the required amount of time.

14. Main and Unit Auxiliary Transformer Preoperational Test Summary

a. Test Objective - To demonstrate that the Main and Unit Auxiliary Transformers are capable of supplying the necessary power to the associated unit during normal plant start up or shutdown.

The capability of the Transformers to supply the assigned ESF load will also be verified.

b. Acceptance Criteria

1) The transformers maintain steady-state bus voltage within design limits to the assigned ESF bus, per Section 8.3.

2) The transformers are capable of supply the ESF-sequenced load of Train A without voltage degradation that precludes ESF component operation, per Section 8.3.

3) The transformers can be connected to any 13.8 kV Standby Bus and supply steady-state, Trains A, B, C, ESF loads, per Section 8.3.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) The required component test has been completed.

3) Approved logic, wiring diagrams, and vendors' technical data are available.

d. Method

1) Simulate where required, protection feature operation and verify alarms and control system interlocks.

2) Place transformers in normal alignment to associated unit, simulate a Mode I (Safety Injection Actuation); verify transformers' capability to start and supply ESF loads of Train A.

3) Transfer ESF loads of Trains B and C to this source without loss of voltage and/or loads.

15. River Service Transformer and Switchgear Acceptance Test Summary (Not Used)

16. 13.8 kV Emergency Transformer Acceptance Test Summary

a. Test Objective - To verify that the 13.8 kV emergency transformer will function as an additional alternate source of power to any one of the Class 1E 4160 V busses.

b. Acceptance Criteria

1) The emergency transformer shall supply a no-load voltage to busses 1K and 1L.

2) The Transformer Auxiliary Systems, such as cooling equipment and indications, shall meet the design requirements.

3) The transformer shall maintain the bus voltage within acceptable limits.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) The incoming breaker for the Unit 2 1K bus and all breakers on bus 1L are locked open.

3) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Energize busses 1K and 1L from the emergency transformer and verify that the transformer meets the voltage requirements.

2) Simulate required signals to verify proper operation of protective relaying and controls.

3) With the Class 1E busses energized from the emergency transformer and the appropriate loads connected, verify that the transformer meets the power requirements.

Note: Operational load verification shall be accomplished during the performance of the 13.8 kV Emergency Bus Acceptance Test.

17. 13.8 kV Emergency Bus Acceptance Test Summary

a. Test Objective - This test will verify that the emergency bus functions as designed and will connect the emergency transformer to the Class 1E busses.

b. Acceptance Criteria

1) Protective relays and control circuits function per design requirements.

2) The bus handles the required electrical load without undue thermal or mechanical stresses.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Emergency transformer is checked out and energized.

3) Class 1E busses are available and can be energized from the emergency bus.

4) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Verify function of interlocks designed to prevent tying the 13.8 kV emergency bus to the 13.8 kV standby busses.

2) Energize busses E1A, E1B, and E1C from the emergency bus, and connect the available loads to a minimum of 6 MVA total. (During normal operation only one bus can be connected from the Emergency Transformer.)

3) With sufficient load on the bus, verify its ability to perform its intended function without undue thermal or mechanical stresses.

4) Verify that the transformer auxiliary systems function as necessary to maintain operating temperature below maximum limits.

18. Heat Tracing System Preoperational Test Summary (Not Used)

19. Communications Page and Warning System Preoperational Test Summary

a. Test Objective - This test will demonstrate the adequacy of the plant public address system, the intracommunication between all local stations and the plant to offsite communication systems, and will show that the evacuation alarm can be heard from any location in the plant under all required conditions.

b. Acceptance Criteria

1) The Communications System provides for paging, normal plant communications, and alarm signaling in accordance with design requirements, per Section 9.5.2.

2) The evacuation alarm can be heard from any location in the plant, per Section 9.5.2.

3) The Emergency Communications Systems function as required by the Emergency Plan.

c. Prerequisites

1) All Communications System installation and component checks are completed.

2) Ambient noise levels are established, with equipment operating, for locations where noise levels might interfere with communications.

d. Method

1) Test hand set stations and jack stations for proper operation in all modes.

2) Test alarms.

3) Shift applicable equipment to alternate power sources and verify operation.

4) Test plant communications to offsite locations per the requirements of the Emergency Plan.

20. Channels I, II, III, and IV l25 vdc, Class 1E Battery Chargers Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Trains A, B, and C 1E battery chargers function as designed to provide an adequate source of 125 vdc.

b. Acceptance Criteria

1) Verify that each battery charger functions as designed to provide 125 vdc to charge its associated battery from design minimum voltage to its fully charged state, within 12 hours, while supplying its normal steady-state loads per Section 8.3.2.

2) Verify that the voltage output is within ±1.0 percent of its required value (on a volts-per-cell basis), per Section 8.3.2.

3) The battery chargers for Channels I and IV demonstrate ±10 percent load-sharing capability, per Section 8.3.2.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) The batteries are installed and complete.

3) All normal loads (or an equivalent load) are available.

4) Electrical power is available to operate the system.

5) Approved wiring diagrams, logic diagrams, and vendors' technical data are available.

d. Method

1) With the battery charger fully loaded, verify that the DC output voltage parameters are within specifications.

2) With the battery voltage at the design minimum, and a steady-state test load connected, verify the battery charger(s) will recharge the associated battery within 12 hours.

3) For Channels I and IV, verify the battery chargers demonstrate ±10 percent load sharing capability.

4) Verify battery charger interlocks and alarms.

21. <u>125 vdc Battery and Bus Channels I, II, III, and IV Preoperational Test Summary</u>

a. Test Objective - This test will verify that the 125 vdc 1E battery and associated bus provide a reliable source of 125 vdc power for safe shutdown of the reactor and to maintain the reactor in a safe shutdown condition on loss of normal AC power to the associated battery charger(s).

b. Acceptance Criteria

1) The 125 vdc battery shall be capable of supplying its safeguard equivalent transient loads during loss of AC power for a 2-hour period, per Section 8.3.2.

2) The 125 vdc battery shall be capable of providing its rated capacity in accordance with Institute of Electrical and Electronics Engineers (IEEE) 485-1978.

c. Prerequisites

1) Construction is complete and the system is released for testing in accordance with the Startup Manual.

2) Required electrical tests are complete and the battery is fully charged.

3) Approved wiring diagrams, logic diagrams, and vendors' technical data are available.

4) Component testing to verify performance of the DC loads at a minimum voltage equal to the allowable minimum battery terminal voltage for the discharge load test has been completed.

d. Method

1) With the battery fully charged, deenergize the charger and verify that the battery supplies adequate power to a test load equivalent to the 2-hour safeguard transient loads.

2) With the battery fully charged and rated test load connected, discharge the battery for 8 hours and verify individual cell limits are not exceeded.

3) With simulated inputs, verify battery system alarms and ground detection.

22. Class 1E AC Power Distribution Preoperational Test Summary

a. Test Objective - To verify that the Class 1E AC power systems (4.16 kV, 480 vac) provide the nominal voltage at no-load, together with the associated interlocks, alarms, and protective features required to support ESF actuation.

b. Acceptance Criteria

1) The no-load voltage on the Class 1E 4.16 kV and 480 vac busses are within design limits, per Section 8.3.

2) Interlocks and protective features function as per design, per Section 8.3.

3) The Class 1E AC power systems distribute voltage at the required levels during LOOP and/or ESF actuation, per Section 8.3.

Note: This function is specifically verified in the integrated safeguards and SBDG tests.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required component tests are complete.

d. Method

1) Energize the Class 1E AC power system and verify bus voltages are within their respective range.

2) Simulate, where required, protection feature operation and verify alarms and response.

3) During simulated LOOP and/or ESF actuation, verify proper supply and load breaker response.

23. 480 V Class 1E Switchgear Preoperational Test Summary
(Integrated into Test Summary 22)

24. 480 V Class 1E Motor Control Center Preoperational Test Summary
(Integrated into Test Summary 22)

25. 120 vac Class 1E Power Source, Channels I, II, III, and IV Preoperational Test Summary

a. Test Objective - To verify that the preferred (Class 1E inverters) and associated alternate (regulating transformers) function to provide an adequate source of AC power.

b. Acceptance Criteria

1) Each preferred or associated alternate power source provides the designated instrument channel bus with the designed voltage and frequency within specified regulation limits, per Section 8.3.1.

2) A loss of the 480 vac input to the inverter does not cause loss of inverter output voltage, per Section 8.3.1.

3) Controls and interlocks function as per design, per Section 8.3.1.

4) Each preferred and associated alternate power source can provide rate output without exceeding regulation limits, per Section 8.3.1.

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Adequate equipment room cooling is in operation to maintain temperature at 50° -140° F and 20-80 percent relative humidity (RH) or equipment room cooling system, or equivalent, is in operation.

3) Approved wiring diagrams and vendors' technical data are available.

d. Method

1) Energize the designated inverter and associated regulating transformer to verify output voltage and frequency.

2) Apply test load to each source and verify regulation remains within specified limits.

3) Deenergize the 480 vac supply to the inverter and verify the inverter AC output remains energized.

4) Simulate, where required, protection feature operation, and verify alarm response.

26. <u>120 vac, Class 1E Bus, Channels I, II, III, and IV Preoperational Test Summary</u>

a. Test Objective - To demonstrate that the 120 vac Class 1E busses can be energized from the designated preferred (inverter) or alternate (regulating transformer) power source without paralleling of the sources.

b. Acceptance Criteria

1) The 120 vac Class 1E busses can be energized from either the designated preferred or alternate power source, per Section 8.3.1.

2) A mechanical interlock precludes parallel operation of the preferred and alternate power sources, per Section 8.3.1

c. Prerequisites

1) The system has been released for testing in accordance with the Startup Manual.

2) Required component tests have been completed.

3) Approved wiring diagrams and vendors' technical data are available.

d. Method

1) Energize the 120 vac 1E bus from the preferred, and then alternate, source to verify routing to designated bus.

2) Panels DP001 and DP002 - manually switch the bus loads between preferred and alternate source to verify anti-parallel interlock.

Panels DP1201 through DP1204 - manually switch the bus loads between preferred and alternate source to verify bypass switch functionality. CN-2923

3) With simulated inputs, verify undervoltage and ground detection alarms.

27. <u>Containment Heating, Ventilating and Air-Conditioning Penetration Space Exhaust Subsystem Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that the Penetration Space Exhaust Subsystem can maintain atmospheric conditions within design requirements of Section 9.4.1.

b. Acceptance Criteria

1) The room temperatures are maintained inside the penetration room at less than 104°F.

2) The emergency air handling units will automatically start upon either a safety injection (SI) or LOOP signal.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and duct leak testing are completed.

3) Control air supply is available.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) Main exhaust system is in operation.

7) Air balancing is complete.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

9) Technical Support Center (TSC) Chilled and Essential Water Systems are in service.

d. Method

1) Line up the system for normal operation.

2) Verify that the penetration room temperatures are maintained at less than maximum limits in accordance with design.

3) Simulate necessary signals to verify that interlocks, alarms, and controls function as designed.

28. <u>Containment HVAC Normal and Supplementary Purge Subsystem Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate the ability of the Normal and Supplementary Purge System to supply and exhaust air from the Containment Building.

b. Acceptance Criteria

1) The normal Containment purge supply and exhaust system operates in accordance with system design, per Section 9.4.5.

2) The supplementary Containment purge supply and exhaust system operates in accordance with design requirements, per Section 9.4.5.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and duct leak testing are complete.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) Control air supply is available.

6) Required filters are installed.

7) Air balancing is complete.

8) Main exhaust system is in operation.

9) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Operate the Normal Containment Purge Supply and Exhaust Subsystem to verify that the subsystem meets design requirements.

3) Operate the Supplementary Purge Supply and Exhaust Subsystem to verify that the subsystems meet design requirements.

4) Operate, or simulate operation, of the system to verify that controls, interlocks, and alarms function as designed.

29. <u>Containment HVAC RCFC System Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate the capability of the RCFC System to maintain atmospheric conditions inside the Containment Building.

b. Acceptance Criteria

1) The RCFC System maintains temperatures inside the Containment Building within the limits prescribed by the system design, per Section 9.4.5. (Note: this verification will be performed during Hot Functional Testing at no-load temperature and pressure, with all normal equipment in operation and extrapolated to full power operation.)

2) The Chilled Water System provides the required amount of chilled water in accordance with design, per Section 9.4.5.

3) The Reactor Containment Fan Cooler (RCFC) System fan motor current is within the design value at conditions representative of accident conditions per Section 9.4.5. (Note: this testing will be performed during integrated leak rate testing (ILRT) and evaluated to address air density, temperature, humidity, fan speed, and blade angle).

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and duct leak testing are completed.

3) System piping hydrostatic test is completed.

4) Required electrical power supply systems are available.

5) Control air supply is available.

6) Air balancing is completed.

7) Reactor Containment Building (RCB) CCWSs are available for RCFCs.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Operate the RCFC System.

3) Measure the chilled water flow and RCFC inlet and outlet temperatures for each train, and verify that they meet design requirements.

4) Verify that the temperatures inside equipment cubicles meet design requirements.

5) Measure the filter leakage-dioctyl phthalate (DOP) test for high-efficiency particulate air filters (HEPA) and refrigerant test for carbon filters. Measure filter differential pressures to ensure that they meet design requirements.

6) Verify that chilled water supply and discharge valves close on SI signal.

7) During ILRT, measure the RCFC fan motor current and verify compliance with design requirements.

8) Operate or simulate the system to verify controls, interlocks, and alarms function as designed.

30. Containment HVAC Control Rod Drive Mechanism Ventilation Subsystem Acceptance Test Summary

a. Test Objective - This test will demonstrate the capability of the system to maintain the CRDM coils within their design temperature range.

b. Acceptance Criteria - CRDM ventilation subsystem maintains temperatures at the CRDM coils within design limits of Section 9.4.5.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and duct leak testing are completed.

3) Required electrical supply systems are available.

4) Required instruments are calibrated.

5) Reactor head is installed.

6) CRDM coils are installed and can be energized.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Start CRDM fans and verify that operations flow meets design requirements.

2) Operate, or simulate operation of, the system to verify that controls, interlocks, and alarms function in accordance with design.

3) During hot functional testing (HFT), with the CRDM coils energized, verify that coil temperature remains within the design temperature range.

31. Containment HVAC Isolation Valve Cubicle Subsystem Preoperational Test Summary

a. Test Objective - This test will demonstrate that the IVC Subsystem maintains the IVC auxiliary feedwater (AFW) pump areas within their design temperature range.

b. Acceptance Criteria - The supply fans operate in accordance with system design requirements, per Section 9.4.8.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and duct leak testing are completed.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) A control air supply is available.

6) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) With the AFW pumps operating, verify that the ambient temperature inside the IVC meets design requirements.

3) Operate, or simulate the operation of, the system to verify that controls, interlocks, and alarms function as designed.

4) During hot functional testing operate all AFW pumps at the same time for a sufficient time to demonstrate adequate ventilation in the pump area.

31a. Containment HVAC Isolation Valve Cubicle Subsystem Acceptance Test Summary

a. Test Objective - This test will demonstrate that the IVC Subsystem maintains the IVC penetration areas within their design temperature range.

b. Acceptance Criteria - The supply fans operate in accordance with system design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and duct leak testing are completed.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) A control air supply is available.

6) Approved P&IDs, logic, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) During HFT, verify that the penetration area temperatures inside the IVC meets design requirements.

3) Operate, or simulate the operation of, the system to verify that controls, interlocks, and alarms function as designed.

32. Mechanical Auxiliary Building HVAC Preoperational Test Summary

a. Test Objective - This test will demonstrate the capability of the MAB Room cooler HVAC Subsystem to control atmospheric conditions within the equipment rooms.

b. Acceptance Criteria

1) MAB Room Coolers maintain atmospheric conditions within each room in accordance with the system design, per Section 9.4.3.

2) The Chilled Water System provides the required amount of chilled water in accordance with system design, per Section 9.4.3.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and flushing of the system piping are completed.

3) Required electrical power supplies are available.

4) Required instruments are calibrated.

5) A control air supply is available.

6) The Chilled Water System(s) is operational.

7) Ductwork leak testing and air balancing are completed.

8) Approved P&IDs, logics, specifications, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure the chilled water pump pressure, chilled water flow, and chilled water temperatures for each chiller and verify that they met the design requirements.

3) With the normal and/or emergency equipment in the space operating, measure the temperature and humidity of the associated rooms to ensure that they meet design requirements.

4) Simulate the necessary signals to verify that automatic controls, alarms, and interlocks function as designed.

32a. Mechanical Auxiliary Building HVAC Acceptance Test Summary

a. Test Objective - This test will demonstrate the capability of the MAB HVAC system to control atmospheric conditions within the building.

b. Acceptance Criteria

1) MAB supply and exhaust subsystems maintain atmospheric conditions in accordance with the system design.

2) The Chilled Water System provides the required amount of chilled water in accordance with system design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and flushing of the system piping are completed.

3) Required electrical power supplies are available.

4) Required instruments are calibrated.

5) A control air supply is available.

6) The MAB Chilled Water System(s) is operational.

7) Duct work leak testing and air balancing are completed.

8) Approved P&IDs, logics, specifications, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Verify that the MAB is maintained at a pressure less than atmospheric.

3) Measure the chilled water pump pressure, chilled water flow, and chilled water temperatures for each chiller and verify that they meet the design requirements.

4) Measure the temperature and humidity of the MAB to ensure that they meet design requirements.

5) Check filter leakages (DOP test for HEPA filters and refrigerant test for carbon filters) and measure filter-differential pressure to ensure that they meet design requirements.

6) Simulate the necessary signals to verify that automatic controls, alarms, and interlocks function as designed.

33. Electrical Auxiliary Building HVAC System Preoperational Test Summary

a. Test Objective - This test will demonstrate the capability of the EAB HVAC System to control atmospheric conditions within the building.

b. Acceptance Criteria

1) EAB makeup, supply, and exhaust subsystems maintain atmospheric conditions in accordance with system design, per Section 9.4.1.

2) Pressure inside the EAB meets design requirements, per Section 9.4.1.

3) The Chilled Water Subsystem provides the required amount of chilled water in accordance with system design, per Section 9.4.1.

4) Control room atmospheric conditions are maintained in accordance with system design requirements, per Sections 9.4.1 and 6.4.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and system piping flushing are completed.

3) A chilled water supply is available.

4) Required electrical power systems are available.

5) Required instruments are calibrated.

6) Duct leak testing and air balancing are completed.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Verify that all rooms are maintained at required atmospheric conditions.

3) Measure the space temperatures and humidity inside the EAB to ensure that they meet design requirements.

4) Measure the Chilled Water System pressure, flow, and temperatures.

5) Measure the filter leakages (DOP test for HEPA filters and refrigerant test for carbon filters) and filter differential pressures to ensure that they meet design requirements.

6) Within the Control Room System, simulate a high radiation and a safety injection (SI) signal to verify that makeup fans and cleanup fans are automatically started and verify that the exhaust fans trip.

7) Simulate necessary signals to verify that automatic controls, interlocks, and alarms function as designed.

8) Simulate a high radiation signal and SI signal and verify that the control room air cleanup units are automatically started.

9) Simulate high levels of acetaldehyde and vinyl acetate at the chemical monitors and verify damper response and pressure controller ability to maintain a positive control room pressure per design requirements.

10) Simulate fire detection inputs and verify that fire dampers, isolation dampers, and relief dampers function per design requirements to maintain control room habitability.

11) Verify that the battery room ventilation systems are sufficient to maintain the hydrogen concentration below design limits with two exhaust fans operating.

34. Diesel Generator Building HVAC Preoperational Test Summary

a. Test Objective - This test will demonstrate the capability of the DGB HVAC System to maintain the required atmospheric conditions inside the DGB.

b. Acceptance Criteria - DGB supply subsystem and exhaust subsystem maintain atmospheric conditions in accordance with system design, per Section 9.4.6.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and flushing of system piping are completed.

3) Required electrical power supply systems are available.

4) A source of control air is available.

5) Required instruments are calibrated.

6) Air balancing is complete.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) With each respective train DG operating, measure the air temperature within the DGB and verify that it meets design requirements.

3) Simulate necessary signals to verify that automatic controls, dampers, interlocks, and alarms function as designed.

4) Demonstrate proper functioning of the DGB Tank Room and Ventilating Subsystem to assure purge capability meets design requirements.

35. <u>Fuel Handling Building HVAC System Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate the capability of FHB HVAC System to control atmospheric conditions within the building and maintain the negative pressure inside the building in accordance with design conditions.

b. Acceptance Criteria

1) The FHB HVAC supply subsystem and exhaust subsystem maintain required atmospheric conditions inside the building in accordance with the system design, per Section 9.4.2.

2) FHB pressure is in accordance with the design, per Section 9.4.2.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Cleaning of duct work and flushing of system piping are completed.

3) Control air supply is available.

4) Required electrical power supply systems are available.

5) The required chilled water system is operational.

6) Duct leak testing and the air balancing are completed.

7) Required instruments are calibrated.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Verify that the FHB is maintained at the negative pressure.

3) Verify that atmospheric conditions in the various cubicles are maintained.

4) Measure the air temperatures and atmospheric conditions inside the building.

5) Measure filter leakages (DOP test for HEPA filters and refrigerant test for carbon filters) and measure filter differential pressures to ensure that they meet design requirements.

6) Simulate a high-radiation signal, and verify that the exhaust booster fans and the cleanup filters are automatically started.

7) Simulate necessary signals to verify that automatic controls, interlocks, and alarms function as designed.

36. <u>Essential Cooling Water Building HVAC System Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that the ECW HVAC System maintains required ambient temperature inside the ECW Building.

b. Acceptance Criteria - The atmospheric conditions inside the ECW Building are maintained in accordance with system design, per Section 9.4.7.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required electrical power supply systems are available.

3) Required instruments are calibrated.

4) Control air supply is available.

5) Air balancing is complete.

6) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) With each associated train ECW pump operating, measure the ambient temperature inside the ECW Building to ensure that it meets design requirements.

3) Operate, or simulate, necessary signals to verify that automatic controls, interlocks, and alarms function as designed.

37. Annunciator System Acceptance Test Summary(Not Used)

38. Main Turbine Acceptance Test Summary

a. Test Objective - This test will demonstrate that the main turbine is ready for initial operation.

b. Acceptance Criteria

1) Turbine can be placed on turning gear with no evidence of binding or rubbing throughout the length of the turbine shaft.

2) Turbine supervisory instruments are in service and function as designed.

3) Turbine mechanical protective devices function as designed.

c. Prerequisites

1) Turbine Lube Oil System is in service.

2) The system is released for testing in accordance with the Startup Manual.

3) Required component testing is completed.

4) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Simulate signals as necessary to verify operation of the Turbine Supervisory Instrument System.

2) Place the main turbine on turning gear and verify that no rubbing or binding exists.

3) Reset turbine and verify correct operation of mechanical turbine protective devices. (Note: Turbine performance will be verified during the power ascension program.)

39. Main Generator Acceptance Test Summary

a. Test Objective - The objective of this test is to demonstrate that the main generator will be available for operation when the turbine has obtained rated speed.

b. Acceptance Criteria

1) Generator controls and protective relays function as designed.

2) Generator hydrogen leakage rates are within limits.

c. Prerequisites

1) Hydrogen Seal Oil System is in operation.

2) Stator Cooling system is in operation.

3) The system is released for testing in accordance with the Startup Manual.

4) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

5) Required component testing is completed.

6) Generator air test is complete.

d. Method

1) Purge the generator with carbon dioxide and fill with hydrogen. Verify leakage to be within limits.

2) Simulate signals as necessary to verify proper operation of generator protective relays and controls.

40. Electrohydraulic Control System Acceptance Test Summary

a. Test Objective - The EHC System must function to protect the main turbine generator from overspeed and provide sufficient flexibility of control to allow the generating unit to function throughout the load range.

b. Acceptance Criteria

1) The EHC power unit supplies the required flow of high pressure fluid at the correct pressure.

2) The turbine throttle, governor, reheat stop, and interceptor valves close within the allowed time limits.

3) The turbine trips following the receipt of a trip signal from the SSPS.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing and cleaning operations are complete.

3) Required component testing is completed.

4) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

5) A source of cooling water is available to the EHC power unit.

d. Method

1) Operate the EHC System power unit, and stroke all turbine throttle, governor, reheat stop, and interceptor valves verifying closure times per design requirements.

2) Simulate a trip at the SSPS and verify loss of auto-stop oil pressure.

3) Verify the proper flow and pressure at design point for each EHC pump.

4) Operate or simulate the operation of the system to verify that all interlocks, controls, and alarms function as designed.

41. <u>Containment Hydrogen Monitor Preoperational Test Summary</u>

a. Test Objective - This test will verify that the hydrogen (H_2) monitor functions as designed to indicate Containment hydrogen concentration.

b. Acceptance Criteria

1) Verify that the Containment H_2 monitor indicates H_2 concentration to within the required tolerances, per Section 7.6.5.

2) Verify that all valves function as designed, per Section 7.6.5.

3) Verify that acceptable minimum flow rates can be obtained through the analyzer, per Section 7.6.5.

4) Verify the heat tracing functions in accordance with design requirements, per engineering specifications.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Approved logics, wiring diagrams, and vendors' technical data are available.

3) Required hydrostatic testing is complete.

4) Required electrical and instrument tests are complete.

d. Method

1) Line up the system for normal operation.

2) Verify the analyzer's calibration by using a suitable calibration gas, or by using approved vendor procedures.

3) Operate the system and measure flow through the analyzer and verify that it meets minimum design flow rates through all the sample points.

4) Operate, or simulate the operation of, the system to ensure that all controls, interlocks, and alarms function as designed.

5) With the system in a standby condition, verify that the heat tracing functions in accordance with design.

42. <u>Solid-State Protection System Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that the SSPS functions as designed so as to mitigate the consequences of postulated Design Basis Accidents (DBAs).

b. Acceptance Criteria

1) Verify that the SSPS functions as designed such that all the setpoints associated with the SSPS inputs are within the specified tolerances, per Section 7.2.1.

2) Verify that the combinational logic associated with the SSPS inputs is correct, per Section 7.2.1.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Electrical power is available to operate the system.

3) Approved logic diagrams, wiring diagrams, and vendors' technical data are available.

4) Analog equipment (process racks) associated with the SSPS inputs are calibrated.

d. Method

1) Simulate signals at the input of each protection loop and verify that the associated bistables trip at their required setpoint. Verify that the "tripped" state produces the correct output alarms and responses.

2) Simulate the trips in the various combination states and verify that the applicable protective function occurs. Verify that the "permissives" associated with the trips are functioning properly, by simulating the permissives in conjunction with the trip state.

3) Simulate the required change in the process at the transmitter and verify that the time from reading setpoint to the time the safety function occurs is within allowable limits.

43. <u>Engineered Safety Features Actuation System Trains A, B, and C Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that ESFAS Trains A, B, and C function as designed so as to mitigate the consequences of DBAs.

b. Acceptance Criteria

1) Verify that ESFAS Trains A, B, and C function as designed, per Section 7.3.

2) Verify that upon closure of the master relays, the associated slave relays energize and operate their respective loads, per Section 7.3.

3) Verify that all blocks and inhibits function as designed, per Section 7.3.

4) Verify that the appropriate slave relays latch in as necessary. Verify that the slave relays can be reset by the appropriate control switch, per Section 7.3.

5) Verify that the safeguards test cabinets function as designed, per Section 7.3.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Electrical power is available.

3) Approved logic diagrams, wiring diagrams, and vendors' technical data are available.

4) The SSPS is operable.

d. Method

1) Operate or simulate operation of the master relays, and verify that each slave relay associated with that relay goes to its active or protective state.

2) Simulate the required "at-power" conditions at the SSPS, and verify that all actuation, block, and inhibit logics function per design.

3) Operate, or simulate the operation of, the slave relays and verify that the "latch in" slave relays can be unlatched (reset) using the appropriate control switch.

44. Reactor Coolant Pressure Boundary Leakage Detection System Preoperational Test Summary

a. Test Objective - This test will demonstrate the system's capability to detect the presence of significant leakage from the reactor coolant loops to the Containment atmosphere during normal operations.

b. Acceptance Criteria - The subsystems which comprise the RCPB Leak Detection System provide for monitoring and indication of RCPB leakage in accordance with design requirements and the approved test procedure, per Section 5.2.5. Acceptance criteria for radiation monitor to be in accordance with Section 14.2.12.2, item 50, "Process and Area RMS Preoperational Test Summary".

c. Prerequisites

1) RCPB Leakage Detection System installation and component checks are completed.

2) Associated systems are completed to the extent necessary to allow the conduct of this test.

d. Method

1) Verify, during the RMS Preoperational Test, proper functioning of Containment air particulate monitor and radioactive gas monitor detectors per Section 14.2.12.2, item 50.

2) Verify Containment sump level monitors including associated controls, indications, and alarm function per design requirement.

3) Verify proper functioning of specific humidity-monitoring devices and Containment wide range pressure instruments in accordance with vendors instruction manuals and the approved test procedure.

45. NIS Preoperational Test Summary

a. Test Objective - This test will demonstrate that the excore NIS functions as designed and meets the requirements necessary for safe operation of the plant as outlined in the Technical Specifications.

b. Acceptance Criteria - Each channel of the NIS functions as designed, per Section 7.2.

c. Prerequisites

1) Approved logic diagrams, wiring diagrams, system specifications, and vendors' technical data are available.

2) Required electrical power supplies are available.

3) The NIS is aligned in accordance with the vendors' technical manuals.

4) The associated NIS readout devices are calibrated.

5) The system is released for testing in accordance with the Startup Manual.

d. Method

1) Line up the NIS for normal operation.
2) Simulate signals, as required, to verify that the NIS and associated readout devices and analog equipment function as designed and receive the proper input signals.

3) Verify that the setpoints, interlocks, trip outputs, and alarms function as designed by simulating the required input signals.

4) Verify, by simulating inputs to the NIS, that analog output signals to associated equipment are of proper polarity and span. (Note: Upon completion of the ILRT, the nuclear instrumentation detector tubes will be installed and further testing done on this portion.)

46. Incore Monitoring Instrumentation System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Incore Monitoring System functions as designed and meets the requirements for safe operation.

b. Acceptance Criteria - Drive units, transfer devices, and control/readout equipment function as designed with the exception of scan and record modes of operation.

c. Prerequisites

1) Cleaning operations are complete.

2) Tubing connecting verifications are complete.

3) Required electrical power supplies are available.

4) Approved logic diagrams, wiring diagrams, system specifications, and vendors' technical data are available.

5) A dummy detector is available.

6) The system is released for testing in accordance with the Startup Manual.

d. Method

1) Align the system for normal operation with the exception that the thimbles are not complete.

2) Using a dummy detector, verify detector speeds in the fast and slow modes.

3) Simulate signals (if necessary) to verify that the interlocks and safety features function as designed.

4) Operate the system in all modes to ensure that all drive, transfer, control, and readout devices function as designed.

5) Observe one cycle of the following:

a) Drive dehumidification

b) Leak detection

c) Gas purge

(Note: After core loading, all drive units will be loaded with operational detectors, and further testing will be performed.)

47. <u>Control Rod Drive System Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that the Control Rod Drive System functions as designed and meets the requirements necessary for safe plant operation.

b. Acceptance Criteria

1) The Control Rod Drive System functions as designed in the following modes, per Sections 3.9.4 and 4.6:

a) Automatic

b) Manual (programmed)

c) Manual (individual bank)

d) Trip

2) The CRDM currents and timing are within design limits, per Sections 3.9.4 and 4.6.

c. Prerequisites

1) Approved logic diagrams, wiring diagrams, system specifications, and vendors' technical data are available.

2) Required electrical power supplies are available for operation.

3) The Control Rod Drive System has been aligned in accordance with the vendors' technical data.

4) The RCS is filled and vented.

5) The system is released for testing in accordance with the Startup Manual.

d. Method

1) Line up the Control Rod Drive System for normal operation, with the exception of the control rod drive shafts, which are not installed.

2) Verify and record the current profiles for each CRDM when operated in both the IN and OUT modes at the maximum operating speed.

3) Verify that the system functions as designed in automatic and manual using simulated signals where applicable.

4) Verify that alarms and interlocks function as designed, using simulated signals as applicable. (Note: After fuel loading, further full-load mechanism tests will be performed.)

5) Obtain the response time from a Reactor Trip Breaker opening until the loss of moveable gripper coil voltage occurs.

48. Boron Concentration Measurement System Acceptance Test Summary
(Not Used, see Test Summary No. 80.)

49. Digital Rod Position Indication System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Digital Rod Position Indication System functions as designed and meets the operational requirements such as to provide individual control rod position indication.

b. Acceptance Criteria - The Digital Rod Position Indication System generates rod position and, as required, alarms, interlocks, and, if applicable, control functions as designed, per Section 7.7.1.3.2.

c. Prerequisites

1) Required electrical power supplies are available.

2) The system is released for testing in accordance with the Startup Manual.

3) The Digital Rod Position Indication System is aligned using vendors' recommended cold calibration values.

4) Approved logic diagrams, wiring diagrams, system specifications, and vendors' technical data are available.

d. Method

1) Set up the system for normal operation.

2) Simulate the necessary signals to verify proper operation of alarms, interlocks, and control functions as specified.

50. Process and Area Radiation Monitoring System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the RMS functions as designed to provide continuous plant radiation data and automatically control specified radioactive fluid and gaseous streams.

b. Acceptance Criteria

1) Each radiation monitor can be placed in a normal operating condition.

2) The RMS indicates and alarms high radiation or high radioactivity for detection channels as designed, per Sections 11.5 and 12.3.4.

3) The RMS indicates and alarms radiation monitor failures including loss of sample flow, power failure, and detector failure as designed, per Sections 11.5 and 12.3.4.

4) The isolation and actuation functions of the RMS function as designed, per Sections 11.5 and 12.3.4.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required electrical power supplies are available for operation.

3) Hydrostatic testing, where applicable, is completed.

4) Flushing and cleaning are complete.

5) Test/check sources are installed.

6) The RMS is aligned and calibrated and the prerequisite testing for each interfacing system has been completed such that the response to RMS functions can be demonstrated.

7) Approved logic diagrams, wiring diagrams, and vendors' technical data are available.

8) The calibration of the radiation monitor to be tested has been performed and indications are within required tolerances.

d. Method

1) Line up the RMS and interfacing systems for normal operation as required.

2) Simulate signals as necessary to verify the proper operation of alarm isolation and actuation functions.

3) Verify sample paths and flow rates to detectors by placing systems in operation and monitoring flow rates.

4) Actuate built-in check source or check current to check operation of each detector.

5) Demonstrate readings of monitors are indicated locally, when required, and are indicated in the Control Room and Health Physics office.

6) Verify radiation monitors register full-scale when exposed to simulated radiation levels in excess of full-scale indication.

7) Demonstrate that radiation monitors operate as stand-alone units and demonstrate that a failure in one monitor will not cause a loss of operating function of any other monitor.

51. <u>Fire Protection System (Water Subsystem) Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that the Fire Protection System is capable of providing water for fire fighting.

b. Acceptance Criteria

1) The system is capable of providing adequate water flow to sprinklers, per Section 9.5.1.

2) Pump pressure-discharge flow curve is in accordance with manufacturer's specifications.

3) Deluge and leak/flow detection valves function as designed, per Section 9.5.1.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) System hydrostatic test is completed.

4) Required electrical power supply is available.

5) Required instruments are calibrated.

6) Control air supply is available.

7) Adequate water is available in firewater storage tank.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure pressure on supply headers to sprinklers and verify sprinkler flow patterns for main, auxiliary, and standby transformers.

3) Simulate necessary signals to verify that the system's automatic controls and interlocks functions properly.

4) Perform a start from the cold condition on each fire pump and measure the flow and discharge pressure at the design point and verify that it meets minimum design requirements.

5) With the block valve closed, operate the deluge valves one at a time and verify that they open.

52. <u>Fire Protection System (Foam Subsystem) Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that the Fire Protection System (Foam Subsystem) functions as designed.

b. Acceptance Criteria

1) The deluge valves for the foam nozzles actuate in accordance with system design requirements, per Section 9.5.1.

2) Other valves in the system function as designed, per Section 9.5.1.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Hydrostatic test for system piping is completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Simulate the necessary signals to open the deluge valves of the foam water sprinkler system one at a time and verify that the deluge valves opens. (Note: Its associated block will be closed at this time.)

3) Verify by system operation that flow detection valves and alarms function as designed. (Note: Only that flow required to actuate these devices shall be used.)

4) Verify that the subsystem alarms function in accordance with design.

53. <u>BOP Sampling System Acceptance Test Summary</u>

a. Test Objective - This test will demonstrate that the BOP Sampling System is capable of transporting process samples.

b. Acceptance Criteria

1) The sample system pump and coolers operate in accordance with system design.

2) Sample analyzers and sample selection valves function in accordance with design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Sample lines are flushed/cleaned.

3) Required hydrostatic testing of sample lines is completed.

4) Systems for which samples are to be collected are in operation.

5) A cooling water system is operational for sample coolers.

6) Required electrical supply systems are available.

7) Required instruments and analyzers are calibrated.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.
2) Measure the pump discharge pressure and cooler inlet and outlet temperature to verify that they conform to design requirements.

3) Operate or simulate operation of the system to verify that controls, interlocks, and alarms function in accordance with design.

54. Condenser Gas Removal System Acceptance Test Summary

a. Test Objective - This test will demonstrate the capability of the Condenser Gas Removal System to remove noncondensible gases from the condenser at a rate that is in accordance with system design.

b. Acceptance Criteria - Mechanical vacuum pumps maintain the required vacuum and flow rate in accordance with system design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Required system hydrostatic testing is completed.

4) Required electrical power systems are available.

5) Required instruments are calibrated.

6) Control air supply is available.

7) The Cooling and Sealing Water Systems are available for the mechanical vacuum pumps.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation with the exception that the main condenser shall be isolated from the suction of the vacuum pumps.

2) Measure vacuum in the suction header and noncondensible gas flow at the discharge of the vacuum pumps.

3) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function as designed.

55. Main Turbine Lube Oil System Acceptance Test Summary

a. Test Objective - This test will demonstrate the capability of the Lube Oil System to supply adequate lubricating oil to the main turbine generator.

b. Acceptance Criteria

1) Lube Oil System pressure is in accordance with system design.

2) Automatic controls and interlocks function in accordance with design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Required electrical power supply systems are available.

4) Required system instruments are calibrated.

5) A sufficient supply of oil is available.

6) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure pressure of lube oil conditioner in accordance with requirements.

3) Verify that the lube oil conditioner operates in accordance with requirements.

4) Operate, or simulate the operation of, the system to verify that controls, alarms, and interlocks function as designed. (Note: Further testing will be done during the power ascension testing.)

56. Steam Generator Feed Pump and Turbine Lube Oil System Acceptance Test Summary

a. Test Objective - This test will demonstrate the capability of the Lube Oil System to provide adequate lubricating oil to the steam generator (SG) feed pump and turbine.

b. Acceptance Criteria - Lube Oil System pressure is in accordance with system design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations of the Lube Oil System are complete.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) A sufficient supply of oil is available.

6) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure lube oil pressure and lube oil filter differential.

3) Operate, or simulate the operation of, the system to verify that controls, alarms and interlocks function as designed. (Note: Further testing will be done during the power ascension testing.)

57. Main Turbine Gland Steam System Acceptance Test Summary

a. Test Objective - This test will demonstrate the capability of the Main Turbine Gland Steam System to provide adequate steam to turbine shaft seals to prevent air inleakage.

b. Acceptance Criteria - System operating pressures are in accordance with system design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Required electrical power supply systems are available.

4) Required system instruments are calibrated.

5) Turbine Lube Oil System is operational and main turbine is on turning gear.

6) Auxiliary Boiler (no longer in use) and Auxiliary Steam Supply Systems are in operation. CN-3226

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure the pressure on the seal steam supply headers, and verify that steam seal regulator operation is in accordance with system design.

3) Operate, or simulate the operation of, the system to verify that controls, alarms, and interlocks function as designed.

58. Feed Pump Turbine (FPT) and FPT Gland Steam Acceptance Test

a. Test Objective - This test will demonstrate the operability of the FPT.

b. Acceptance Criteria - Turbine controls function as necessary to allow operation of the FPT and protect the turbine from overspeed conditions.

c. Prerequisites

1) Construction is complete and the system is released for testing in accordance with the Startup Manual.

2) FPT Lube Oil System is in operation.

3) Required instruments are calibrated.

4) A source of control air is available.

5) Required flushing and cleaning operations are completed.

6) Approved P&IDs, logic diagrams, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Place FPT on turning gear and verify that no rub or binding exists.

2) Reset turbine and simulate signals as necessary to verify proper operation of throttle and governor valves.

3) Operate or simulate operations as necessary to check interlocks and controls for proper operation.

4) Verify proper operation of steam seal regulator by simulating necessary input signals. (Note: Further testing of the FPTs and Gland Steam System will be conducted during initial heatup.)

59. Isophase Bus Cooling System Acceptance Test Summary

a. Test Objective - The Isophase Bus Cooling System shall maintain the main generator output bus temperature below design limits during normal operation of the generating unit.

b. Acceptance Criteria

1) System's fans and filters shall operate within design limits.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required cleaning operations are completed.

3) Required instruments are calibrated.

4) Electric power, control air, and a source of cooling water are available.

5) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Operate system fans and verify proper differential pressure.

2) Measure differential pressure across system filters and verify less than design.

3) Simulate signals and operate system's controls as necessary to verify that interlocks and controls function as designed.

60. H_2 Seal Oil System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the H_2 Seal Oil System supplies sealing oil to the generator shaft to maintain the hydrogen atmosphere inside the generator.

b. Acceptance Criteria - Hydrogen Seal Oil System operates in accordance with the system design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Main Turbine Lube Oil System is in operation.

4) The Main Turbine is on turning gear.

5) Generator is not charged with H_2 gas.

6) Required electrical power supply systems are available.

7) Required instruments and analyzers are calibrated.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure the pressures on seal supply headers or at the inlet to the H_2 seals to verify that system operation is in accordance with design.

3) Operate, or simulate the operation of, the system to verify that controls, alarms, and interlocks function as designed. (Note: The H_2 Seal Oil System will be tested in actual operation during the generator air test.)

61. Stator Cooling Water System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Stator Cooling Water System will provide an adequate flow of acceptable quality water through the generator stator bars to remove the heat generated by machine losses.

b. Acceptance Criteria

1) Stator cooling water pumps provide adequate cooling water to the generator.

2) Stator Cooling Water System filters and demineralizers maintain the stator water quality within prescribed limits.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required flushing and cleaning operations are completed.

3) Required hydrostatic tests are completed.

4) Spool pieces are installed to direct cooling water flow through the generator.

5) Required component tests are completed.

6) Approved P&IDs, logic diagrams, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Operate stator cooling pumps and verify that flow and pressure at the design point meet or exceed required values.

3) Verify that water quality is within system specifications.

4) Simulate required signals to verify proper operation of system interlocks and controls.

62. Primary Sampling System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Primary Sampling System is capable of transporting process samples.

b. Acceptance Criteria

1) The Primary Sampling System, system coolers, and pressure-regulating devices operate in accordance with the system design, per Section 9.3.2.

2) Sample analyzers and sample selection valves function in accordance with the design requirements, per Section 9.3.2.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Sample lines are flushed/cleaned.

3) Systems from which samples are to be collected are in operation.

4) A cooling water system is available for sample coolers.

5) Required electrical power supply systems are available.

6) Required instruments and analyzers are calibrated.

7) Control air supply is available.

8) Sample hood(s) ventilation systems are in operation.

9) Approved P&IDs, logic diagrams, wiring diagrams, and vendors' technical data are available.

10) The hydrostatic testing is completed.

11) Required component tests are completed.

d. Method

1) Line up the system for normal operation.

2) Demonstrate that liquid and gas samples can be obtained from sample points and that samples obtained are within the prescribed tolerance when compared with laboratory-analyzed samples.

3) Establish purge times.

4) Measure inlet and outlet temperatures and pressures of sample cooler to verify for proper operation.

5) Demonstrate sample vessels can be removed and replaced.

6) Operate, or simulate operation of, the system to verify that alarms function as designed.

63. Auxiliary Steam Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Auxiliary Steam System is ready to receive steam.

b. Acceptance Criteria - Controls and interlocks function as designed to allow safe operation of the system.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required flushing and cleaning operations are completed.

3) Required instruments are calibrated and a source of instrument air is available.

4) Required hydrostatic testing is completed.

5) Approved P&IDs wiring diagrams, logic diagrams, specifications, and vendors' technical data are available.

d. Method

1) Operate power-oriented valves and verify proper timing and valve stroke.

2) Simulate necessary signals to verify proper operation of system interlocks and controls.

64. Condensate System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Condensate System is capable of transferring an adequate quantity of condensate from the hotwell to the Feedwater System, and that the Hotwell Level Control System functions as required to maintain the proper levels.

b. Acceptance Criteria - The Condensate System operates in accordance with design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Required hydrostatic testing is completed and adequate water is available in the hotwell to provide minimum net positive suction head (NPSH) for the condensate pumps.

4) Adequate water is available in the condensate storage tank (CST) to provide makeup to the Condensate System.

5) Required electrical power supply systems are available.

6) Required instruments are calibrated.

7) Control air supply is available.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure pressure and flow to verify that the system is operating in accordance with design requirements.

3) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function as designed.

4) Further testing will be conducted during the power ascension test program to verify the system meets design requirements.

65. Main Feedwater System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the safety-related FW system components function as designed.

b. Acceptance Criteria

1) The Main FW isolation valves go to their safety position upon receipt of an FW isolation signal within the allowable time assumed in the safety analysis, per Section 10.4.7.

2) The Main FW flow control valves go to their safety positions upon receipt of an FW isolation signal, per Section 10.4.7.

3) The Main FW flow control valves respond properly to flow control signals, per Section 10.4.7.

4) The main feed pump trip circuitry responds properly to a FW isolation signal.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing and cleaning operations are completed to the extent necessary to support testing.

3) The system hydrostatic test is completed to the extent necessary to support testing.

4) Required electrical supply is available.

5) Control air supply is available.

6) Required instruments and loops are calibrated.

7) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Simulate a main FW isolation signal for ESF Train A and verify the following:

   a) Main FW flow control valves close

   b) Main feed isolation valves close within the allowable time requirements

3) Realign the system for normal operation and simulate a main FW isolation signal for ESF Train B: Verify the following:

   a) Main FW flow control valves close

   b) Main FW isolation valves close within the allowable time requirements

4) Simulate changing levels in the SGs and verify that the main FW flow control valves and associated controllers respond per design.

5) Verify proper operation of alarms and interlocks.

6) Simulate a FW isolation signal and verify the main feed pump control circuitry receives a trip signal.

65a. Main Feedwater System Acceptance Test Summary

a. Test Objective - This test will ensure that the nonsafety-related FW System components function as designed.

b. Acceptance Criteria - The FW heater temperature and level control systems function in accordance with design requirements.

c. Prerequisites

   1) The system is released for testing in accordance with the Startup Manual.

   2) Flushing and cleaning operations are completed to the extent necessary to support testing.

   3) The system hydrostatic test is completed to the extent necessary to support testing.

   4) Required electrical supply systems are available.

   5) A control air supply is available.

   6) The required instruments are calibrated.

   7) Approved P&IDs, logic, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system for operation.

2) Simulate temperature and level signals to the temperature and level control systems and verify the alarms, controls, and interlocks function per design requirements.

3) Further testing of the FW System will be performed during the power ascension testing.

66. Condensate Polisher System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Condensate Polisher System provides the required amount of proper grade water to the FW System. (Note: Demineralization capability will be tested during low power and power ascension testing.)

b. Acceptance Criteria

1) The differential pressures across the polishing units at rated flow are in accordance with the system design requirements.

2) The Condensate Polisher Regeneration System functions in accordance with system design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Required hydrostatic testing is completed.

4) Required electrical power systems are available.

5) Control air supply is available.

6) Required instruments are calibrated.

7) Polishing units are filled with required type and amount of resin.

8) Condensate System is operational and is recirculating to condenser.

9) The Plant Bulk Acid and Bulk Caustic Storage Systems are available.

10) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system in accordance with the test requirements.

2) With the Condensate System recirculating to the condenser, place the polishing units into service one at a time.

3) Establish the design flow through each polishing unit. Measure flow and differential pressure across the polishing unit.

4) Transfer one depleted condensate polisher bed to the regeneration system and operate the system through one regeneration cycle.

5) Measure acid, caustic injection rates, and rinse water flow to ensure they meet design requirements. Measure the conductivity of the effluent at the end of the regeneration cycle to verify it conforms with design requirements.

6) Operate, or simulate the operation of, the system to verify that controls, interlocks, and alarms function in accordance with design requirements.

67. Open Auxiliary Cooling Water System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Open Loop Auxiliary Cooling Water System (ACWS) provides adequate cooling water for heat exchangers in the system.

b. Acceptance Criteria - The system is capable of providing the required quantity of cooling water in accordance with system design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) Required electrical power supply systems are available.

4) Control air supply is available.

5) Required instruments are calibrated.

6) Seal water supply to auxiliary cooling water open loop pumps is available.

7) Adequate suction head is available for the open loop auxiliary cooling water pumps.

8) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

9) The system hydrostatic test is completed.

d. Method

1) Line up the system for normal operation.

2) Measure the pumps' discharge pressures and flows at their design point.

3) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function as designed.

4) Verify proper operation of the system strainer.

5) Verify adequate flow through system heat exchangers by either a direct flow measurement or a ΔP-versus-flow measurement.

68. Circulating Water System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Circulating Water System is capable of providing adequate cooling water to the condenser.

b. Acceptance Criteria - The Circulating Water System is capable of providing adequate cooling water to the condenser.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Condenser hydrostatic test is completed.

3) Required electrical systems are available.

4) Required instruments are calibrated.

5) Control air supply is available.

6) Screens and screen wash system are operational.

7) Required suction head is available for circulating water pumps.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up system for normal operation.

2) Operate the traveling screens and screen wash system and verify they meet design requirements.

3) Prime the water box and observe the water box level gauges to verify that the water box runs full.

4) Operate, or simulate the operation of, the system to verify that controls, interlocks, and alarms function in accordance with design.

5) Condenser performance will be verified during power ascension testing.

69. <u>Closed Loop Auxiliary Cooling Water System Acceptance Test Summary</u>

a. Test Objective - This test will demonstrate that the Closed Loop ACWS provides adequate cooling water flow for the heat exchangers (HXs) within the system.

b. Acceptance Criteria - The system is capable of providing the required cooling water flow to each HX in accordance with the system design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) Required electrical power supply systems are available.

4) Control air supply is available.

5) Required instruments are calibrated.

6) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

7) Required hydrostatic testing is completed.

d. Method

1) Line up the system for normal operation.

2) Measure pump discharge pressures and flows at their design point to verify adequate capacity.

3) Verify adequate water flow through each HX in the system by using installed flow indicators or measuring heat exchanger ΔP.

4) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function as designed.

70. <u>Essential Cooling Pond Makeup Station Acceptance Test Summary</u>

a. Test Objective - This test will demonstrate the ability of the ECP Makeup Station to provide the required quantity of makeup water to the ECP during continuous plant operation.

b. Acceptance Criteria - Makeup pumps deliver the required quantity of water in accordance with the design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required flushing/cleaning operations are completed.

3) Required instruments are calibrated and a source of control air is available.

4) Required electric power is available.

5) System hydro is completed.

6) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Operate the makeup pumps and verify that the flow meets system design requirements.

3) Operate, or simulate operation of, system components to verify interlocks and controls function.

71. Instrument Air System Acceptance Test Summary

a. Test Objective - This test will demonstrate the capability of the Instrument Air System to supply clean, dry, oil-free compressed air at required pressure and flow rate.

b. Acceptance Criteria - Instrument air pressure, flow, and quality are in accordance with system design.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) Required hydrostatic testing is completed.

4) Required electrical power systems are available.

5) Required system instruments are calibrated.

6) A cooling water supply is available for the compressors and after coolers.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

8) Station air compressors, aftercoolers, and air receiver are operational.

d. Method

1) Line up the system for normal operation.

2) Measure the flow, pressure, and temperature of the air. Determine the quality of instrument air by analyzing for oil, water, and particulate matter.

3) Simulate required signals to verify automatic controls, interlocks, alarms, and setpoints function properly.

4) Verify automatic operation of air dryers for one regeneration/service cycle.

5) Measure the dew point at the Instrument Air System and verify that it is within design limits.

6) Verify the backup standby instrument air compressor starts automatically upon low air receiver pressure.

7) Simulate a low instrument air header pressure and verify the station air system automatically supplies the instrument air dryers.

8) Verify the backup standby station air compressor starts automatically upon low station air receiver pressure.

9) Perform test method 2 with station air compressors supplying the instrument air filters and dryers.

72. <u>BOP Chemical Feed System Acceptance Test Summary</u>

a. Test Objective - This test will demonstrate the capability of the system to provide chemical feed for condensate and AFW systems.

b. Acceptance Criteria - Metering pumps deliver the required flow to Condensate and AFWS in accordance with design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing and hydrostatic tests are completed.

3) Required electrical power systems are available.

4) Required instruments are calibrated.

5) System tanks contain an adequate amount of hydrazine and ammonium hydroxide.

6) Systems supplied by BOP chemical feed are available.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Operate and adjust the metering pumps to deliver flow in accordance with design requirements.

3) Operate, or simulate operation of, the system to verify controls, interlocks, and alarms function in accordance with design.

73. Reactor Coolant System Hydrostatic Test Summary (Included in the preoperational test program)

a. Test Objective - This test will demonstrate the integrity and leak tightness of the RCS by performing a hydrostatic test of the system in accordance with Section III of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code.

b. Acceptance Criteria

1) The cold hydrostatic test satisfactorily verifies the integrity and leak tightness of the RCS welds.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) The RCS flushing/cleaning operations are completed.

3) Reactor internals, except fuel assemblies, are in place.

4) CVCS is in service.

5) Necessary auxiliary systems required to support RCS operation are in service.

6) Required electrical supply system is available.

7) Required instruments are calibrated.

8) Control air supply is available.

9) Pressurizer heater breakers are operational and racked out.

10) Applicable P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

11) Pressurizer safety valves are removed and blank flanges are installed.

12) Pressurizer relief valves are set per test requirements.

d. Method

1) Line up the RCS for normal operation.

2) Complete the filling and venting of the RCS.

3) Operate the reactor coolant pumps (RCPs) as required to establish test nil-ductility temperature requirements.

4) Pressurize the RCS within the maximum allowable rate and in the prescribed increments until the desired test pressure is obtained and stabilized at the test pressure for the required time.

5) Reduce the test pressure to the design pressure and perform inspections of the RCS welds, joints, piping, and components.

6) Reduce system pressure to below the test pressure value.

74. <u>Incore Thermocouple and Resistance Temperature Detector Cross-Calibration Preoperational Test Summary</u>

a. Test Objective - This test will determine the response characteristics of each RTD and the response characteristics and isothermal correction factor for each incore thermocouple.

b. Acceptance Criteria

1) Response characteristics for each RTD are consistent with vendor calibration data.

2) Isothermal calibrations are recorded and, in each case, when applied to the applicable incore thermocouple, give thermocouple output consistent with RTD data with the unit at hot zero power (HZP) per Sections 7.2.2.3.2 and 7.7.1.9.1.

c. Prerequisites

1) The reactor is in the cold shutdown condition.

2) Incore thermocouple checkout is completed.

3) RTDs are installed and have satisfactorily undergone continuity, resistance, and alignment checks.

4) Cold junction box RTDs are calibrated.

d. Method

1) As the unit is heated up from cold shutdown during the hot functional test, isothermal conditions are established at specified intervals.

2) At each isothermal plateau, resistance versus temperature is measured and plotted for all RTDs, and the variation between each RTD and the average of the RTD readings is calculated and recorded.

3) The temperature for each incore thermocouple is measured and recorded at each plateau to generate individual isothermal correction factors.

4) The operation of remote and local temperature instrumentation is observed.

5) Cold junction box temperatures are recorded at each plateau.

75. PRT Preoperational Test Summary

a. Test Objective - This test will verify that the PRT provides for adequate control of the discharge from the primary power reliefs and safety valves.

b. Acceptance Criteria - PRT provides for control and disposal of primary plant coolant discharge in accordance with design requirements per Section 5.4.11.

c. Prerequisites

1) Hydrostatic test of PRT is completed.

2) PRT installation checks are completed.

3) Radioactive Waste Disposal System is completed to the extent necessary to allow conduct of this test.

d. Method

1) Fill PRT with grade A water, utilizing the internal spray header and, as pressure increases, verify alarm and interlock operations, and spray flow within specified internal tank pressures.

2) Demonstrate ability to maintain nitrogen blanket in PRT.

3) Verify transfer flow paths from PRT.

4) Verify the flow through the reactor coolant drain tank HX, for cooling of the PRT contents, meets design requirements.

76. Safety Injection System Trains A, B, and C Preoperational Test Summary

a. Test Objective - This test will demonstrate that each train of the SIS operates in accordance with the system design.

b. Acceptance Criteria (Cold)

1) Flow and pressure in each train of the system are in accordance with system design, per Section 6.3.

2) System response to SI signals is in accordance with system design requirements, per Section 6.3.

3) System operates on normal electrical power supply as designed, per Section 6.3. (Note: Operation on alternate power supply will be verified during SBDG preoperational testing.)

4) Accumulator performance is in accordance with design requirements per Section 6.3.

Acceptance Criteria (Hot) - Accumulator discharge check and isolation valves function according to design requirements, per Section 6.3.

c. Prerequisites (Cold)

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) System hydrostatic test is completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) Reactor vessel is open to the refueling cavity, and the refueling pool is available to receive water if required.

7) The refueling water storage tank (RWST) contains an adequate amount of water.

8) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

9) Nitrogen pressurization system is operational to the accumulators.

Prerequisites (Hot)

1) Cold prerequisites 1, 2, 3, 4, 5, and 9.

2) RCS is closed, hot, and pressurized.

d. Method (Cold)

1) Verify that valves and components required for SIS operation are sequenced properly and respond to the SI signal within the minimum required times.

2) Operate the high-head safety injection (HHSI) and low-head safety injection (LHSI) pumps on miniflow recirculation to the RWST, measure minimum recirculation flow and pump discharge pressure, and verify that pumps can be operated on miniflow with no performance degradation.

3) Operate HHSI and LHSI pumps on recirculation test line to the RWST and measure pump flow and discharge pressure.

4) Using manual initiation from the control board, initiate an SI signal and perform full flow tests for HHSI and LHSI pumps. Measure flow and pump discharge pressure and adjust system as necessary to ensure that pumps do not exceed this maximum allowable runout. Measure flows in all branch lines and adjust as necessary to ensure that flow distributions for injection lines are within design limits.

5) Verify that the SI pumps will not trip under conditions of maximum flow.

6) Verify the nitrogen and liquid charging systems for the accumulators function according to design.

7) Verify that the accumulator discharge isolation valves function properly under maximum expected differential pressure and verify discharge flows are in accordance with design requirements.

8) Verify that automatic controls, interlocks, and alarms function as designed.

9) System operation on alternate electric power supply will be tested during DG preoperational testing.

Method (Hot)

1) Verify that accumulator discharge isolation valves open automatically on an increasing RCS pressure signal per design requirements.

2) Verify that discharge check valve leakage is within allowable tolerance.

3) Verify that accumulators will discharge to the RCS on decreasing pressure per design.

77. Thermal Expansion and Vibration (Steady State/Transient)

a. Test Objectives

1) Thermal Expansion

These tests determine that the piping systems listed in Section 3.9.2.1, which normally operate at temperatures greater than 250°F, expand within acceptable limits during heatup to operating temperature and return to an acceptable position when cooled down, without adverse binding.

2) Steady-State Vibration

These tests will demonstrate that the steady-state vibration of piping and components of the systems listed in Section 3.9.2.1 are within acceptable limits at operating conditions.

3) Transient Effects

These tests will verify that the dynamic (transient) effects, designated by the design engineer, are within allowable limits.

b. Acceptance Criteria

1) Thermal Expansion

a) Piping movements do not cause piping rubs, misalignments, or excessive hanger deflections, or undue stress on associated components, per Section 3.9.2.1.

b) Piping and components return to approximate base line position on cooldown, per Section 3.9.2.1.

c) The piping system is not restrained against thermal expansion, except as provided by design, per Section 3.9.2.1.

d) Engineering evaluates measured deflections to verify that the results conform to established criteria and resolves any discrepancy found to exist, per Section 3.9.2.1.

2) Steady-State Vibration

Vibration levels are within the limits specified in applicable codes, per Section 3.9.2.1.

3) Transient Effects

Vibration levels are within the limits specified in applicable codes, per Section 3.9.2.1.

c. Prerequisites

1) Associated systems are completed to the extent necessary to allow conduct of the test.

2) Hanger travel stops/lock pins are removed.

3) Reference points for measurements are established.

4) Measurement devices or fixtures are installed for this test.

d. Method

1) Operate equipment in the various operating modes to heat up to normal operating temperatures.

2) Record movements during operation of equipment.

3) Subject the specified piping systems to various flow modes and transients, such as pump trips and valve closures, as required.

4) Visually inspect or measure the vibrational deflections of the piping and components.

5) Record cold base line data.

6) Record hot setting movements.

7) Verify that piping and components return to within allowable tolerances of cold base line position upon cooldown.

78. Residual Heat Removal System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the RHRS is capable of providing the required flow to the RCS for plant cooldown.

b. Acceptance Criteria

1) Pump pressure and flow in each train are in accordance with the system design for RCS cooldown and transfer of water from the RCS to the RWST, per Section 5.4.7.

2) Inlet valves are closed automatically upon increasing RCS pressure and prohibited from opening until RCS pressure is decreased to design limits, per Section 5.4.7. The Auto-Closure Interlock function was deleted by Modifications 88291 (Unit 1) and 99292 (Unit 2).

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) System hydrostatic test is completed.

4) RCS is operable and contains sufficient water for RHR operation.

5) Required electrical power supply systems are available.

6) Required instruments are calibrated.

7) Approved P&IDs, logic diagrams, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Simulate an increasing RCS pressure and verify inlet valves close automatically, per design requirements. The Auto-Closure Interlock function was deleted by Modifications 88291 (Unit 1) and 99292 (Unit 2).

3) Simulate a decreasing pressure and verify inlet valves are prohibited from opening until the permissive setpoint is reached, per design requirements.

4) Operate the system in the miniflow recirculation mode, measure pump discharge pressure and flow and verify the system can sustain prolonged operation in this mode with no deleterious effects.

5) Place the RHRS in normal operation, measure pump discharge pressure and verify the system performs at maximum required flow rates, per design requirements.

6) Demonstrate the ability of the RHRS to transfer water from the RCS to the RWST.

7) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function as designed.

8) RCS cooldown capability will be verified during hot functional testing.

79. Containment Spray System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Containment Spray System is capable of providing a sufficient quantity of water with additive at the required pressure for Containment spray, and to verify that the spray header and nozzles are unobstructed.

b. Acceptance Criteria

1) Containment spray pump discharge pressure and flow are in accordance with the design requirements, per Section 6.2.2.

2) Spray nozzles are unobstructed.

3) Eductor functions to drain spray additive tank (SAT) in the required time period, per Section 6.2.2.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) Required ventilation systems are available.

6) The RWST contains an adequate amount of water for the Containment spray pump to operate on recirculation.

7) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

8) The system hydrostatic test is completed.

9) The SAT contains an adequate amount of water to complete the test.

10) The nitrogen pressurization system to the SAT is operable.

d. Method

1) Line up the system for recirculation to the RWST.

2) Simulate a high Containment pressure signal and verify response time for system operation, measure pump discharge pressure and flow to verify pump

discharge pressure/flow curve at the maximum required flow rate, per design requirements.

3) Operate the system in the miniflow mode, measure the pump discharge pressure and flow, and verify the system can sustain operation in this mode and meets the design.

4) Verify the response time and operation of the eductors for the spray additive tank by pumping the tanks to the RWST.

5) Force air through the Containment spray ring headers and verify that spray nozzles are open by visual inspection of each nozzle.

6) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function as designed.

80. Chemical and Volume Control System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the CVCS functions according to design.

b. Acceptance Criteria

1) The charging pumps meet or exceed design flow and pressure requirements, per Section 9.3.4.

2) The charging and letdown, normal and alternate, flow paths function in accordance with design requirements, per Section 9.3.4.

3) The Volume Control Tank (VCT) Level System diversion valves and cover gas system function per design requirements, per Section 9.3.4.

4) The chemical control, purification, boric acid, and makeup subsystems function in accordance with design requirements, per Section 9.3.4.

5) The boron thermal regeneration subsystem functions in accordance with design requirements, per Section 9.3.4. (The BTRS chillers are abandoned and the BTRS can only operate in boron storage mode at a reduced efficiency). CN-3217

6) The heat tracing functions in accordance with design requirements per engineering specification.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) System hydrostatic test is completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) A cooling water supply is available for the CVCS components.

7) The RCS is at the condition specified in the approved test procedure.

8) The Reactor Makeup Water System (RMWS) is operational.

9) The Nuclear nitrogen (N_2) System is operational.

10) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

11) Component testing is completed, and filters are installed.

12) The Gaseous Radwaste, Boron Recycle, and Liquid Radwaste Systems are operational as required.

13) The Overpressure Protection System is in operation.

14) Boron is available for batching operations.

15) The Boron Concentration Measurement System is calibrated.

d. Method

1) Line up the system for normal operation.

2) Place charging pumps in operation on recirculation, record pump discharge pressure and flow, and verify that recirculation valves close when charging flow is increased above setpoint and reopen when decreased below setpoint, per design requirements.

3) Operate charging pumps in full flow operation, record pump discharge pressure and flow, and verify pumps meet design requirements.

4) Verify proper operation of the normal and excess letdown components and subsystem per design requirements.

5) Demonstrate the capability to provide seal flows to the RCPs and the proper operation of seal water injection, return, and seal water bypass systems per design requirements.

6) Verify pressure drops and flows for system filters per design requirements.

7) Verify proper operation of the auxiliary spray to the pressurizer per design requirements.

8) Pressurize the VCT with nitrogen and verify the cover gas system functions per design.

9) Vary the VCT level and verify letdown is diverted to the BRS on high level and charging pump suction is diverted from the VCT to the RWST on low level per design requirements.

10) Verify chemicals can be introduced into the charging flow for pH and oxygen control.

11) Verify proper flow and pressure drops across cleanup demineralizers per design requirements.

12) Verify the CVCS reactor makeup control functions per design requirements in the automatic makeup, dilute, alternate dilute, borate, and manual modes.

13) Operate the boric acid transfer pumps in recirculation and normal modes, record pump discharge pressure and flow in both modes, and verify the pumps meet or exceed design requirements.

14) Verify that a solution of boric acid can be mixed, transferred, stored, and recirculated per design requirements.

15) Verify the Boron Thermal Regeneration System (BTRS) chillers and pumps function as designed (BTRS chillers are abandoned and associated piping and pumps are drained and isolated). CN-3217

16) Operate the BTRS with borated letdown flow to determine the operational capabilities for storage and release of boron, per design requirements (BTRS chillers are abandoned and associated piping and pumps are drained and isolated).

17) Operate or simulate operation of the subsystems to verify that controls, interlocks, and alarms function as designed.

18) With the system filled and in a standby condition, verify that the heat tracing functions in accordance with design.

81. <u>Standby Diesel Generator Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate that the SBDGs start, load sequentially, and perform in accordance with system design. Operation of the ESF equipment during performance of this testing will demonstrate the ability of the emergency ventilation systems to perform in accordance with design.

b. Acceptance Criteria

1) The diesel engine, generator, and support systems function in accordance with system design, per Section 8.3.1.1.4.

2) Sequential loading and sequential loading response times are within allowable limits, per Section 8.3.1.1.4.

3) Emergency ventilation systems maintain ESF equipment within its design temperature range, per Section 9.4.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required cleaning/flushing operations are completed on the DG and its support systems.

3) Required support systems are operational.

4) Engine and generator mechanical checks are complete.

5) Generator and associated equipment electrical tests are complete.

6) Required instrumentation is calibrated.

7) Safeguard loads associated with the standby generator are operational.

8) Approved P&IDs, logic diagrams, wiring diagrams, and vendors' technical data are available.

9) Sufficient loads are available to operate the DG at maximum rated output.

10) The reactor vessel head is removed and the refueling cavity is capable of receiving water.

d. Method

1) Operate, or simulate operation of, the control system to verify that controls, interlocks, and alarms function as designed.

2) Verify the DG and its subsystems do not exceed their respective design ratings when subjected to the 8,760-hour load rating for a period of approximately 22 hours and the 2-hour overload rating for a period of approximately 2 hours with a minimum run time of 24 hours.

3) Verify each DG individually will auto-start in the required time, and provide power at the proper regulation to its designated, sequenced, safeguards loads for an adequate period of time.

4) Verify DG response to safeguards actuation signals with units receiving simultaneous auto-start signals.

5) With safeguards or equivalent loads connected, demonstrate DG transient response to the loss of the largest single load and the complete loss of safeguard load by verifying the voltage requirements are met and that the overspeed limits are not exceeded.

6) Verify that, with the DGs loaded, the DGs can be paralleled with the offsite power system, the loads transferred from the diesel to the offsite power system without power interruption, the DG can be isolated and restored to the standby status.

7) Verify the emergency ventilation systems are capable of maintaining ESF equipment within its design temperature range during the extended running periods.

8) Verify ESF equipment performs per design requirements while operating on the DG supply bus.

9) Immediately after performing step d. 2), shut down the diesel and perform testing in accordance with step d. 3).

10) Demonstrate that each DGs capability to supply emergency power within the required time is not impaired during normal periodic testing.

11) Perform a minimum of 23 valid tests per DG with no failures by starting, loading the DG to 50 percent of continuous rating, and operation for a minimum of one hour.

82. Boron Recycle System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the BRS is capable of recovering boron from reactor coolant transferred to this system.

b. Acceptance Criteria

1) The recycle evaporator operates in accordance with design requirements, per Section 9.3.4.

2) System pumps meet design point requirements, per Section 9.3.4.

3) System demineralizers and filters operate within design limits, per Section 9.3.4.

4) The heat tracing functions in accordance with design requirements per engineering specification.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required flushing and cleaning are completed.

3) Required instruments are calibrated and a source of control air is available.

4) Auxiliary steam is operational.

5) A source of cooling water is available for the recycle evaporation.

6) Reactor makeup water is available.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

8) System hydrostatic testing is complete.

d. Method

1) Operate system pumps and measure pressure and flow to verify that they meet design point requirements.

2) Verify that system filters and demineralizers operate with differential pressures below design limits.

3) Operate recycle evaporator and verify proper concentration factor and distillate purity.

4) Operate or simulate operation of required system components to verify proper operation of system interlocks, controls, and alarms.

5) With the system filled and in a standby condition, verify that the heat tracing functions in accordance with design.

83. Emergency Boration System Preoperational Test Summary (Not Used)

84. Main Steam System Preoperational Test Summary

a. Test Objective - This test will demonstrate the capability of MS System components to operate in accordance with design.

b. Acceptance Criteria - MS isolation valves, dump valves, and power relief valves operate in accordance with design requirements, per Section 10.3.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required hydrostatic testing is completed.

3) System flushing/cleaning operations are completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) Steam Dump Control System is operational.

7) Applicable P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system in accordance with the test requirements.

2) Operate power relief valves to verify proper operation.

3) Operate MS isolation valves to verify open/close timings.

4) Operate Steam Dump System to verify proper operation using simulated signals.

5) Simulate necessary signals to verify that automatic controls, alarms, and interlocks function properly. (Note: Functional testing of the MS System will be performed during hot functional testing. This will include setpoint verification of the MS safeties.)

85. Auxiliary Feedwater System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the AFWS provides adequate FW to the SGs when the Main FW System is not in service.

b. Acceptance Criteria

1) AFW pumps meet or exceed design point pressure and flow in accordance with the design requirements, per Section 10.4.9. (Note: Turbine-driven AFW pump will be tested during hot functional testing.)

2) The heat tracing functions in accordance with design requirements per engineering specification.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) The system hydrostatic test is completed.

4) Required electrical power systems are available.

5) Required instruments are calibrated.

6) Control air supply is available.

7) Adequate water supply is available from the CST.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

9) SGs are available to receive water.

d. Method

1) Line up the system for normal operation.

2) Operate the pumps in the miniflow mode, measure pump discharge pressure and flow, and verify the system can sustain prolonged operation in this mode with no deleterious effects.

3) Simulate an SI signal and verify the pump response time is within design requirements for flow initiation. Measure pressure and flow at maximum flow for each motor-driven pump to verify that it meets design requirements and is within the design range. Verify pump motor does not trip due to pump runout.

4) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function properly.

5) During hot functional testing with RCPs supplying heat to the secondary side, simulate loss of AC power sources as required, and operate the plant utilizing manual control and the steam-driven AFW pump. The ventilation serving the steam-driven AFW pump area will be disabled during this test.

6) With the system filled and in a standby condition, verify that the heat tracing functions in accordance with design.

86. Fuel Handling Equipment Preoperational Test Summary

a. Test Objective - This test will demonstrate that the fuel handling equipment is capable of loading/unloading fuel into/from the reactor vessel in accordance with system design. (Note: The equipment included in this test is: Refueling Machine, Fuel Handling Machine, New Fuel Elevator, Fuel Transfer System, Rod Cluster Control Changing Fixture, Spent Fuel Assembly Handling Tool, New Fuel Assembly Handling Tool, FHB Overhead Crane, and New Fuel Handling Area Overhead Crane and the Cask Handling Crane. The Containment Polar Crane will have been previously functionally tested, load tested, and placed in service for use by construction.)

b. Acceptance Criteria

1) Fuel Handling System (FHS) is capable of picking up, transferring, and loading fuel assemblies from the new fuel storage area into the reactor vessel, per Section 9.1.4.

2) FHS is capable of picking up, transferring, and unloading fuel assemblies from the reactor vessel to the spent fuel pool, per Section 9.1.4.

3) The fuel-handling tools function as designed, per Section 9.1.4.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Reactor vessel internals, except fuel and upper internals structure, are installed in reactor vessel.

3) Reactor vessel head is removed.

4) Required electrical power supply systems are available.

5) The system is aligned in accordance with the technical manual.

6) Dummy fuel assembly is available.

7) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

8) Polar Crane records of performance testing and load testing are complete and acceptable.

d. Method

1) Load test cranes and hoists in both dynamic (100 percent load) and static (125 percent rated load) modes.

2) Operate the system to successfully transfer and load a dummy fuel assembly from the new fuel storage area to the reactor vessel.

3) Operate the system to successfully unload and transfer a dummy fuel assembly from the reactor vessel to the spent fuel pool.

4) By operation or simulated operation, of the system verify that controls, alarms, and interlocks function as designed.

87. Spent Fuel Pool Cooling System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Spent Fuel Pool Cooling and Purification System functions as designed.

b. Acceptance Criteria - System flow and pressure are in accordance with system design, per Section 9.1.3.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) A control air supply is available.

6) Adequate water is available in the RWST.

7) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

8) The system hydrostatic test is completed.

d. Method

1) Line up the system for normal operation.

2) Measure pressure and flowrates throughout the system to verify proper operation.

3) Measure demineralizer and filter differential pressures.

4) Operate, or simulate operation of, the system to verify that controls, alarms, and interlocks function properly.

5) Place the skimmer loop in operation and verify proper operation of pump and filter.

6) Verify the antisiphon holes are unobstructed.

88. Essential Cooling Water System Preoperational Test Summary

a. Test Objective - This test will demonstrate that each loop of the ECWS is capable of providing adequate cooling water flow to the connected HXs.

b. Acceptance Criteria

1) The flow and pressure of the ECW pumps are in accordance with system design requirements, per Section 9.2.1.2.

2) Adequate cooling water is supplied to each HX in the system, per Section 9.2.1.2.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) System hydrostatic test is completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) ECP level is adequate to provide required NPSH for ECW pumps.

7) ECW Screenwash System is available.

8) Makeup Water System to ECW pond is available.

9) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure pressure and flow of the ECW pumps at three operating points including minimum and maximum flows, to verify proper operation per design requirements.

3) Operate traveling screens and screenwash booster pumps and verify acceptable spray patterns.

4) Measure flow through system HXs by ΔP or flowmeter to verify design cooling requirements.

5) Operate or simulate operation of the system to verify that controls, alarms, and interlocks function as designed.

6) Verify the ECW pumps start automatically with the start of the corresponding train Component Cooling Water (CCW) pumps.

7) Simulate an SI signal and verify that the ECW pumps start per design requirements.

89. Component Cooling Water System Preoperational Test Summary

a. Test Objective - This test will demonstrate that each train of the CCWS is capable of providing adequate cooling water to connected systems/components.

b. Acceptance Criteria

1) The flow and pressure of each train are in accordance with the design requirements, per Section 9.2.2.

2) Adequate cooling water is supplied to each HX in the system, per Section 9.2.2.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) A control air supply is available.

6) Makeup water supply to the CCWS is available.

7) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Measure the pressure and flow of the CCW pumps at a minimum of three flow points, including a low flow and runout flow to verify the pumps perform according to design requirements.

3) Operate, or simulate operation of, the system to verify that interlocks, controls, and alarms function as designed.

4) Verify proper system flow balancing.

5) Verify automatic starting of the standby CCW pump upon tripping of the operating CCW pump for each pump.

6) Verify automatic isolation of the nonsafety-related loop from the remainder of the system, and isolation between the three safety-related loops upon receipt of a safeguards signal.

7) Verify the system water chemistry meets design requirements.

90. Nuclear Nitrogen and Hydrogen System Acceptance Test Summary

a. Test Objective - This test will demonstrate that the Nuclear N_2 and H_2 System components function in accordance with design.

b. Acceptance Criteria - Control valves and pressure regulators operate in accordance with the system design and vendors' technical manuals.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) The system hydrostatic test is completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Pressurize the supply and discharge manifolds. Establish flow paths to the connected systems.

3) Measure the pressures on supply headers.

4) Operate the pressure regulators and control valves to verify proper operation.

5) Operate, or simulate the operation of, the system to verify that controls, interlocks, and alarms function in accordance with design.

91. Gaseous Radwaste System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Gaseous Radwaste System is capable of transporting and processing radioactive gases.

b. Acceptance Criteria - System flows, pressures and temperatures are in accordance with the system design, per Section 11.3.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) The system hydrostatic test is completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) A control air supply is available.

7) Main Exhaust System is available.

8) Nuclear N_2 System is available.

9) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

10) Charcoal has been loaded into the Guard Bed and Charcoal Beds, and the outlet HEPA filter has been installed.

d. Method

1) Line up the system for normal operation.

2) Establish the purge flow to the gaseous radwaste inlet header.

3) Measure flow temperature and pressure in the gaseous radwaste inlet header.

4) Operate the boron recycle evaporator hold up tank compressor and verify correct flow and pressure.

5) Verify proper operation of the chiller package and moisture removal equipment.

6) Operate, or simulate operation of, the system to verify that interlocks, controls, and alarms function as designed.

7) Verify proper operation of the electric nitrogen heater.

92. <u>Containment Isolation Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate the functional performance of the valves and dampers that are provided in those lines which must be isolated immediately following an accident.

b. Acceptance Criteria

1) Proper operation of all Containment isolation valves and equipment necessary to effect Containment isolation is verified, as demonstrated by proper valve closures and system lineups upon the initiation of the Containment isolation signals, per Section 6.2.4.

2) Operating times for all power-operated valves are within the required limits, per Section 6.2.4.

c. Prerequisites

1) Valves that are to be operated as a result of an isolation signal are operable in the automatic mode, and a lineup has been performed with the valves in the opposite position from their normal isolation position.

2) The necessary support systems for isolation actuation are in service to the extent required for this test.

d. Method

1) With the applicable components and support systems operable, Containment isolation signals are simulated to demonstrate automatic Containment isolation.

2) Response times of power-operated valves are measured.

93. Containment Integrated Leak Rate Test Summary

Note: The ILRT is included in the preoperational test program. The Structural Integrity Test (SIT) is a construction test, but is included here for reference since it is conducted just prior to the ILRT.

a. Test Objective - This test will verify that the structural integrity of the Containment is adequate to withstand postulated pressure loads and that the integrated leakage rate will not exceed the Containment DBA leakage rate of 0.3 percent of the Containment volume in 24 hours at the maximum calculated pressure, and to obtain data to establish a base leakage rate to serve as a reference for future Containment leak testing. Also, this test will provide the necessary conditions for verifying the RCFC System for operability per Preoperational Test description, Summary No. 29.

b. Acceptance Criteria

1) The Containment structure meets structural integrity requirements of applicable regulatory guides and the approved test procedure.

2) The initial leak rate test performed at maximum calculated pressure will be considered acceptable if the total leakage rate does not exceed 75 percent of the maximum allowable leakage rate over a 24-hour period, per Section 6.2.6. (Note: See Sections 3.8.1 and 6.2.6 for additional information.)

c. Prerequisites

1) Containment penetrations are installed and penetration local leak rate tests (Type B and C tests as defined in Appendix J of 10CFR50) are completed by the methods described in Sections 6.2.6.2 and 6.2.6.3.

2) Containment Ventilation Systems are operable to the extent required to control Containment internal temperature.

3) Those instruments and/or equipment which might be damaged by external pressure are properly vented to the Containment.

d. Method

1) For the Structural Integrity Test, the Containment will be subjected to a pressure equivalent to 115 percent of the Containment design pressure.

2) A Type A test will be performed at maximum calculated pressure.

3) The test method, duration of stabilization and test periods, and methods of isolation valve closure for the ILRT are described in Section 6.2.6.1.

94. <u>Radioactive Equipment and Floor Drain Sump System Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate the capability of the Radioactive Equipment and Floor Drain Sump System to pump water to the Liquid Radwaste System.

b. Acceptance Criteria - Each sump pump in the radioactive drains system shall function to control sump level and operate in the applicable sequence as described in Section 9.3.3.2.4.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing and hydrostatic testing are completed.

3) Required electrical power supply systems are available.

4) Required instruments are calibrated.

5) Sumps under test are filled with an adequate amount of water.

6) The required control air supply is available.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Vary the sump level and verify that sump pumps start and stop at predetermined levels in accordance with system design requirements.

3) Operate sump pumps and verify flow paths to the Liquid Radwaste System.

4) Operate, or simulate operation of, system to verify that alarms function in accordance with design.

95. Solid Radioactive Waste Preoperational Test Summary

a. Test Objective - This test will demonstrate the capability of the Solid Radwaste System to collect and transport concentrated liquid and spent resins for processing into dry solid waste, and also to compact dry solid waste.

b. Acceptance Criteria - Solid Radwaste System components function in accordance with design requirements, per Section 11.4.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) System hydrostatic testing is completed.

4) Required electrical power supply systems are available.

5) The required control air supply is available.

6) Required instruments are calibrated.

7) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Operate compactor to verify normal operation.

3) Operate, or simulate operation of, the system to verify that controls, interlocks, and alarms function as designed.

96. Liquid Radwaste (Recycle Portion) Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Liquid Radwaste System (recycle portion) collects and processes water from system drains, equipment drains, valve leakoffs, pump seal leakoffs, and tank overflows.

b. Acceptance Criteria

1) The pumps' discharge pressure and flow at design point are in accordance with system design, per Section 11.2.

2) The differential pressures across HXs, demineralizers, and filters at rated flow are in accordance with system design, per Section 11.2.

3) Waste evaporator performance is in accordance with the equipment specifications.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) The system hydrostatic test is completed.

4) Required electrical power systems are available.

5) A control air supply is available.

6) Required instruments are calibrated.

7) A source of steam and cooling water is available for operation of the waste evaporator.

8) Required collection tanks and storage tanks are filled to an adequate level.

9) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Verify that the pump discharge flow and pressure at the design point meets the design requirements.

3) Verify HX, demineralizer, and filter differentials at rated flow.

4) Operate the waste evaporator to verify that its performance meets the design requirements.

5) Operate, or simulate the operation of, the system to verify that controls, interlocks, and alarms function in accordance with design.

97. Liquid Radwaste (Waste Portion) Preoperational Test Summary

a. Test Objective - This test will demonstrate that the Liquid Radwaste System (waste portion) collects, processes, and discharges water from nonradioactive equipment drains, floor drains, and laundry and hot shower facilities.

b. Acceptance Criteria

1) The pumps' discharge pressure and flow at design point are in accordance with the system design, per Section 11.2.

2) Waste filters pass design-rated flow and filter differentials are in accordance with system design, per Section 11.2

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Flushing/cleaning operations are completed.

3) System hydrostatic test is completed.

4) Required electrical power systems are available.

5) Required instruments are calibrated.

6) A control air supply is available.

7) Required collection tanks and storage tanks are filled to an adequate level.

8) Approved P&IDs, logics, wiring diagrams, specifications, and vendors' technical data are available.

d. Method

1) Line up the system for normal operation.

2) Verify pump discharge pressure and flow at the design point to ensure that they meet design requirements.

3) Establish rated flows through filters to verify that filter differential pressures are in conformance with the design requirements.

4) Verify that the radwaste discharge valve to the Circulating Water System responds to loss of power and a high radiation signal in accordance with system design.

5) Operate, or simulate the operation of, the system to verify that controls, interlocks, and alarms function in accordance with design.

98. <u>Reactor Coolant System Hot Functional Preoperational Test Summary</u>

a. Test Objective - This test will demonstrate the performance of components and instrumentation required during normal heatup, hot steady-state, and cooldown operations of the RCS. Also, the test will provide proper operating temperatures and pressures for performing or completing the preoperational tests and component tests dependent upon these conditions as follows:

1) Reactor coolant pump operation.

2) Pressurizer heaters, relief valves, instrumentation, and preliminary spray operation.

3) Thermal expansion

4) Isothermal calibration of RTDs and incore thermocouples

5) SG level instrumentation testing

6) Main steam system, power-operated relief valves (PORVs), safety valve setpoint verification

7) CVCS - Charging system, normal and excess letdown systems, purification system, seal injection, makeup control in all modes except manual, Boron Thermal Regeneration System (BTRS)

8) Reactor internal vibration exposure

9) Vibration measurement of RCS and BOP piping

10) Containment HVAC and subsystems

11) MAB HVAC

12) EAB HVAC

13) CCW

14) Turbine-driven AFW pump

15) Motor-driven AFW pumps

16) Primary sampling system

17) SG blowdown

18) Primary chemistry control

19) SIS accumulator system

20) RHRS operation

21) Demonstrate the ability to perform a shutdown from outside the control room.

22) Provide a temperature correlation for verifying the bench test setpoints for pressurizer safety valves.

b. Acceptance Criteria

1) Satisfactory performance of components and systems exposed to RCS temperatures is demonstrated.

2) Preoperational tests dependent upon RCS temperatures and pressures meet the requirements of the approved test procedures and design requirements.

c. Prerequisites

1) Required support systems and components are available as necessary to perform the RCS heatup and cooldown.

2) The RCS hydrostatic test has been successfully completed.

3) Insulation has been installed as required.

4) The individual prerequisites per the approved test procedures have been, or can be, completed for each test.

5) The pre-hot functional reactor internals vibration examination has been completed, per Section 3.9.2.4.

6) Pressurizer safety valves have been bench tested. Temperature will be monitored on the inlet piping.

d. Method

1) Line up the systems for normal operation.

2) Using the RCPs as a heat source, perform a heatup and cooldown of the RCS utilizing approved operating procedures to the extent practicable and performing the prescribed testing at the designated conditions.

3) Place RCPs in operation, monitor vibration levels and pump parameters, and verify pumps do not rotate in reverse direction when idle with other pumps running.

4) Verify proper operation of pressurizer heaters in controlling pressure, and that power-operated relief valves (PORVs) function and respond per design, instrumentation functions properly and perform a preliminary spray test. (Final spray test and settings must be performed with the reactor core installed).

5) Perform thermal expansion testing per test descriptions 99 and 100.

6) Perform testing of the main steam system per test description 84, except test methods d3 and d4. Main steam safety valve settings will be verified using an hydraulic or a pneumatic boost assembly.

7) Perform testing on the CVCS subsystems per test description 80 which requires RCS hot functional conditions for pressure and temperature as initial conditions.

8) Operate the RCPs for a minimum of 240 hours at full flow to achieve greater than one million cycles on vessel internals. Following hot functional testing, the internals are removed and inspected for vibration effects, per Section 3.9.2.4.

9) Perform Containment HVAC and Containment HVAC subsystem testing, per test descriptions 29, 30, and 31, to verify cooling capacity per design requirements.

10) Perform MAB HVAC testing, per test description 32 to verify, cooling capacity per design requirements.

11) Perform EAB HVAC testing, per test description 33 to verify, cooling capacity per design requirements.

12) Verify CCW operation under operating conditions.

13) Verify turbine-driven and motor-driven AFW pumps operation under operating conditions, per test description 85.

14) Verify operation of the primary and secondary sample systems.

15) Verify SG blowdown operation.

16) Verify the ability of the primary chemistry control system to perform its function under operating conditions.

17) Perform hot testing on the SIS, per test description 76.

18) Verify ability of the RHRS to cool down the RCS.

19) Perform the cold shutdown demonstration from outside the control room, using the safe shutdown controls and instrumentation located outside the control room, by demonstrating the following:

    a) Establish communications between the control room observers and the safe shutdown control locations.

    b) Lower RCS temperature and pressure to permit operation of the RHRS.

    c) Verify the RHRS can be started and controlled.

    d) Verify a heat transfer path to the ECW pond can be established via the CCW and ECWSs.

    e) Verify that the RCS temperature can be reduced approximately 50°F using the RHRS at a rate that does not exceed Technical Specification limits.

    f) Verify that control of those components whose control has been transformed away from the control room is not possible in the control room.

20) Verify response of SG instrumentation under operating conditions.

21) Perform the isothermal calibration of RTDs and incore thermocouples per test description 74.

22) Perform vibration measurements on RCS and BOP components under specified test conditions per test description 101.

23) At HZP conditions, measure the inlet line temperatures to the pressurizer safety valves to provide a method for verifying the bench test setpoint data.

24) Verify proper operation and response of pressurizer level.

99. <u>RCS Thermal Expansion and Restraint Preoperational Test Summary</u>

This section has been deleted, please refer to test description 77.

100. <u>Power Conversion System Thermal Expansion Preoperational Test Summary</u>

This section has been deleted, please refer to test description 77.

101. Operational Vibration Preoperational Test Summary

This section has been deleted, please refer to test description 77.

102. Seismic Monitoring System Acceptance Test Summary

a. Test Objective - This test will demonstrate the operability of the installed seismic instrumentation and its capability to monitor and record seismic disturbance.

b. Acceptance Criteria - The seismic instrumentation is capable of being aligned within design requirements and demonstrates correct response and outputs in response to simulated input signals.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required instruments are calibrated.

3) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Align the seismic instrumentation to a calibrated test signal.

2) Verify that the seismic trigger will actuate the instrumentation per design requirements.

3) Operate, or simulate operation of, the system to demonstrate response and to verify that controls and alarms function as designed.

103. Combustible Gas Control System Preoperational Test Summary

a. Test Objective - This test will demonstrate the proper operation of the hydrogen recombiners.

b. Acceptance Criteria - The hydrogen recombiners, system fans, and filters perform their design function, per Section 6.2.5.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required instruments are calibrated.

3) Required electrical power supply systems are available.

4) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Verify the proper operation of the hydrogen recombiners, including the inlet preheater, heater recombination, and mixing chamber sections.

2) Operate, or simulate operation of, the system and verify that controls and alarms function as designed.

104. Personnel Monitoring and Survey Instrumentation Preoperational Test Summary (Not Used)

105. Plant Process Computer Acceptance Test Summary

a. Test Objective - This test will demonstrate the proper operation of the plant process computer operators console functions, applications programs, and graphic displays.

b. Acceptance Criteria - The plant process computer operators console functions, applications programs, and graphic displays perform in accordance with design requirements.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required electrical power supply systems are available.

3) Computer room HVAC systems are operational as required.

4) Approved P&IDs, logics, wiring diagrams, and vendors' technical data are available.

5) The computer has been internally wired properly and that the control processing unit, input/output, and analog converters function properly by performing the taped diagnostic programs.

6) Inputs to the computer are calibrated and tested, as applicable, for the operators console functions, applications programs, and graphic displays under test.

d. Method - Using the test procedures provided by the vendor, verify the computer programs, functions, and graphic displays perform per design requirements.

106. Time Response Preoperational Test Summary

a. Test Objective - This test will obtain the total response times from the various ESF and reactor trip logic segments by audit of documentation from previous testing and actual testing of the SSPS.

b. Acceptance Criteria - The ESF and reactor trip response times delineated in the Technical Specifications are within the specified tolerance.

c. Prerequisites - Analog equipment (process racks) associated with the SSPS inputs are calibrated.

d. Method

1) Simulate a step change of 10 percent about the setpoint, in the process variable at the transmitter, and measure the time when the simulated process variable is at the setpoint until its associated bistable reaches the "tripped" state.

2) Obtain the response time data accumulated from previous tests (DG, reactor trip breakers, rod control).

3) Compute the total response of each ESF and response time input through to the actuated device and verify these times to be within the allowable limits set forth in the Technical Specifications.

107. Reactor Trip Breaker Preoperational Test Summary

a. Test Objective - This test will verify the operation of the reactor trip and bypass breakers to be in accordance with system design.

b. Acceptance Criteria

1) The reactor trip and bypass breakers operate for both manual and auto trip signals, per Section 7.2.

2) The opening of a trip breaker, with its respective bypass breaker closed, does not cause loss of voltage to the rod control system, per Section 7.2.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) Required instrumentation is calibrated.

d. Method

1) Verify the breaker control circuitry by simulating, from the control board and SSPS, all the inputs.

2) Verify the various combinations of trip breaker and bypass breaker operation and alarms.

108. Reactor Makeup Water System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the RMW System is capable of providing adequate makeup water to connected systems/components.

b. Acceptance Criteria - RMW pumps meet or exceed design flow and pressure in accordance with the design requirements, per Section 9.2.7.

c. Prerequisites

1) The system is released for testing in accordance with the Startup Manual.

2) System flushing/cleaning operations are completed.

3) The system hydrostatic test is completed.

4) Required electrical power supply systems are available.

5) Required instruments are calibrated.

6) Control air supply is available.

7) Demineralized water supply to the reactor makeup water storage tank (RMWST) is available.

8) Prerequisite testing has been identified complete.

d. Method

1) Measure the pressure and flow of the RMW pump at a minimum of three flow points, including a low flow and runout flow, to verify that the pumps perform according to design requirements.

2) Operate, or simulate operation of, the system to verify that interlocks, controls, and alarms function as designed.

3) Verify automatic isolation of nonessential loads from the remainder of the system upon receipt of a safeguards signal.

109. Emergency Response Facility Data Acquisition and Display System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the ERFDADS operates as designed and meets the associated Class 1E operational requirements. The requirements to be validated are the acquisition of data from the Class 1E field sensors, correct algorithmic response and display of data to the ESF Status Monitoring Panel and to the Control Room annunciator panels.

b. Acceptance Criteria

1) All Class 1E data acquisition equipment functions as designed, per Section 7.5.7. The data from the Class 1E field sensors is determined by individual system preoperational tests.

2) The ERFDADS system displays the proper responses on the ESF Status Monitoring Panel and annunciator panels, per Section 7.5.7.

c. Prerequisites

1) Required electrical power supplies are available.

2) The system is released for testing in accordance with the Startup Manual.

3) Required prerequisite testing is completed.

4) Approved logic diagrams, wiring diagrams, system specifications, and vendors' technical data are available.

d. Method

1) Simulate input data at the input termination cabinets.

2) Verify that the ERFDADS system responds as documented in the vendor drawings and algorithm descriptions.

110. ERFDADS Computer Acceptance Test Summary

a. Test Objective - This test will demonstrate the proper operation of the ERFDADS computer system.

b. Acceptance Criteria - The ERFDADS computer performs in accordance with design specifications.

c. Prerequisites

1) Required electrical power supplies are available.

2) The system is released for testing in accordance with the Startup Manual.

3) Computer room HVAC systems are operational as required.

4) Approved logic diagrams, wiring diagrams, system specifications and vendors' technical data are available.

d. Method - Incorporate portions of the ERFDADS Unit 2 Factory Demonstration Test to prove the satisfactory operation of software and hardware which have been revised since the Unit 1 Factory Demonstration Test was conducted. Additional selected tests will be conducted to prove areas not covered in shop tests, factory demonstration test, or site demonstration test.

111. Qualified Display Processing System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the QDPS functions as designed and meets the operational requirements such as to provide control of SG PORVs, reactor vessel head vent valves, AFW flow control limits and ECW flow control to safety-related HVAC chillers.

b. Acceptance Criteria

1) Displays function as designed, per Section 7.5.6.

2) Auxiliary process cabinets and database process cabinets function as designed, per Section 7.5.6.

3) Control functions operate as designed, per Section 7.5.6.

4) Alarms function as designed, per Section 7.5.6.

c. Prerequisites

1) Required electrical power supplies are available.

2) The system is released for testing in accordance with the Startup Manual.

3) Required prerequisite testing is completed.

4) Approved logic diagrams, wiring diagrams, system specifications and vendors' technical data are available.

d. Method

1) Simulate, as needed, the input devices to the QDPS and check for proper display or control functions.

2) Use diagnostic procedures to verify proper operation of the system.

112. Reactor Vessel Level Indicating System Preoperational Test Summary

a. Test Objective - This test will demonstrate that the RVLIS functions as designed.

b. Acceptance Criteria - The RVLIS indication alarms function as designed, per Section 7A.II.F.2.

c. Prerequisites

1) Required electrical power supplies are available.

2) The system is released for testing in accordance with Startup Manual.

3) The thermocouples are in place and the Reactor Vessel Head is mounted on the vessel.

4) Water in the Reactor Vessel may be changed during the performance of this procedure. (Due to plant requirements, this procedure may be performed before or after fuel load).

5) The QDPS system is available.

6) The RVLIS system has been calibrated.

7) Approved logic diagrams, wiring diagrams, system specifications, and vendors' data are available.

d. Method

1) Set up the system for normal operation.

2) Vary Reactor Vessel level through the complete range of RVLIS and verify that RVLIS indication and associated alarms follow Reactor Vessel level.

113. <u>Loose Parts Monitoring System Acceptance Test Summary</u>

a. Test Objective - This test will demonstrate the capability of the Loose Parts Monitoring System to detect abnormal vibrations/loose parts within the lower areas of the four SGs and abnormal signals within the core internals.

b. Acceptance Criteria - The Loose Parts Monitoring System operates as designed, including recorders, alarms and indicators.

c. Prerequisites

1) The system is Released for testing in accordance with the Startup Manual.

2) The required electrical power supply systems are available.

3) Required system instruments are calibrated.

4) Approved logics, wiring diagrams, and vendors' technical data are available.

d. Method

1) Operate, or simulate operation of, the system to verify that controls, alarms, and printer function as designed.

2) Base line data will be collected during the initial startup program (Phase III).

14.2.12.3 Initial Startup Testing. Initial Startup testing includes requirements for completion of various initial startup test procedures to initially fuel the reactor, take the reactor critical for the first time, verify the nuclear characteristics of the reactor, check the functional and operational capabilities of the systems at power, and verify acceptance of the plant through integrated operation. The test procedures expected to be performed, and their general objectives and acceptance criteria, are listed below. Specific, detailed objectives, acceptance criteria, and prerequisites are included in each respective startup test procedure.

The startup tests summarized in the remainder of this section are listed as follows:

1. Moveable Incore Detector Test
2. Rod Position Indication Test
3. Rod Control System Alignment Test
4. Rod Drive Mechanism Timing Test
5. Rod Drop Time Measurement
6. Reactor Coolant System Flow Test
7. Reactor Coolant System Flow Coastdown Test
8. Resistance Temperature Detector Bypass Flow Verification Test (Not Used)
9. Reactor Protection System Trip Circuits Test
10. Pressurizer Effectiveness Test
11. Water Quality Test
12. Zero-Power Physics Tests
13. Natural Circulation Verification
14. Radiation Survey Test
15. Nuclear Instrumentation Calibration Test
16. Effluent, Process, and Area Radiation Monitor Test
17. Flux Distribution Measurements with Normal Rod Pattern Test
18. Axial Xenon Oscillation Test (Unit 1 Only)
19. Power Coefficient Determination Test
20. Plant Response to Load Changes Test

21. Rod Control System At-Power Test

22. Evaluations of Core Performance Test

23. Full Load Rejection Test

24. Loss of Offsite Power Test

25. Shutdown from Outside the Control Room Test

26. Dynamic Rod Drop Test

27. Static RCCA Drop and RCCA Below-Bank Position Measurements Test

28. Pseudo Rod Ejection Test (Unit 1 Only)

29. Chemistry and Radiochemistry Test

30. Reactor Coolant System Loose Parts Monitoring Test

31. Feedwater Temperature Reduction Test

32. Automatic Steam Generator Level Control Test

33. Control of Margin to Saturation Test

1. <u>Moveable Incore Detector Test</u>

a. Test Objective - This test will demonstrate proper alignment, response, and operation of the moveable incore detectors. A test at low power will be performed to verify detector response to actual flux.

b. Acceptance Criteria - A minimum number of detectors and thimbles, as required by the Plant Technical Specifications, are operable.

c. Prerequisites

1) Moveable micro detector thimbles are inserted into the core.

2) Upper internals are installed in the reactor vessel.

3) The Reactor Vessel head is installed with studs tensioned.

4) The RCS is in the cold shutdown condition, or at a power level of 5 percent or less, as dictated by the test requirement.

Note: The portion of the test described as item 1 under "Method" below may be performed without the reactor upper internals and head installed (prerequisites 2 and 3, above).

d. Method

1) With the reactor in the cold shutdown standby condition, the system is operated, manually and automatically, in all modes after setting the indexing and limit switches.

2) With the reactor in the hot standby condition, the response of each channel to simulated detector outputs is verified.

3) With the reactor at less than 5 percent power, the response of each channel to actual flux is verified.

2. Rod Position Indication Test

a. Test Objective - This test will verify that the Digital Rod Position Indication System satisfactorily performs the required indication and alarm functions for each individual control rod under hot standby conditions.

b. Acceptance Criteria - Performance of the Rod Position Indication System for each rod cluster control assembly (RCCA) over its entire length of travel has been verified in accordance with the vendor technical manual.

c. Prerequisites

1) The reactor is at hot standby, no-load operating temperature and pressure, with at least two RCPs running.

2) All Rod Control System equipment has been installed, and all preliminary testing and calibrations have been completed, including testing to demonstrate the operability of inhibit and block functions.

3) Preliminary tests on the Digital Rod Position Indication System have been completed, including the testing to demonstrate the operability of the Rod Insertion Limit Monitor.

4) Pulse-to-analog converters have been aligned.

5) Plant source-range channels are in operation and monitored at all times when rods are being moved.

d. Method

1) Verify, with all rods fully inserted, that rod bottom indication and alarm exists.

2) Verify that the rod bottom indication clears for each rod as it is withdrawn.

3) Verify the rod bottom indication setpoint for each rod as it nears the fully-inserted position.

4) With one rod of a bank electrically disconnected, verify that a rod deviation alarm occurs as the other rods in that bank are positioned the required distance.

3. <u>Rod Control System Alignment Test</u>

a. Test Objective - This test will adjust Rod Control System bank sequencing overlap setpoints and demonstrate proper system control and indication.

b. Acceptance Criteria

1) Bank sequencing and overlap setpoints are in accordance with the STPEGS setpoints documents and step counters perform properly.

2) The Rod Control System performs in accordance with the requirements of the vendor technical manual.

c. Prerequisites

1) Proper identification, connection, and continuity of Rod Control System power and control cabling have been completed.

2) The reactor is in the hot standby condition with control rods latched.

3) Containment integrity is established in accordance with applicable Technical Specifications.

d. Method

1) The Rod Control System is operated in manual and automatic modes, and indications and alarms are observed.

2) Bank start and stop positions during insertion, withdrawal, and overlap operations are recorded.

3) Setpoint adjustments are made as required.

4. <u>Rod Drive Mechanism Timing Test</u>

a. Test Objective - This test will verify proper timing of each Rod Control System slave cycler and will conduct an operational check of each CRDM.

b. Acceptance Criteria - Mechanism timing and operational checks are in accordance with the rod drive mechanism technical manual requirements.

c. Prerequisites

1) All CRDM equipment is installed with the RCCAs attached.

2) The RCS is filled and vented.

3) Base line count rates are established for each source-range channel.

4) The reactor is in the cold shutdown or hot standby condition, as dictated by the test requirements.

d. Method

1) With the reactor in the cold shutdown condition, the timing for each slave cycler is set, measured, and reset as necessary.

2) Each rod drive mechanism is manually operated, checking the latching and releasing features of each in both hot and cold conditions.

5. <u>Rod Drop Time Measurement</u>

a. Test Objective - This test will determine the drop time for each control rod at both full flow and no flow conditions with the reactor in the cold shutdown condition and at no-load operating temperature and pressure.

b. Acceptance Criteria - Drop time for each rod, measured in hot-full-flow conditions, is less than or equal to the maximum value specified in the Technical Specifications.

c. Prerequisites

1) Initial fuel loading has been completed, and the unit is in the cold or hot standby condition with full flow or no flow as required for the particular phase of the test to be performed.

2) Containment integrity has been established in accordance with applicable Technical Specifications.

3) The Rod Position System is operable.

4) All rod cluster control drive mechanisms have had the preliminary checkout completed.

d. Method

1) Withdraw selected bank to the fully withdrawn position.

2) Conduct individual rod drop tests, recording rod drop initiation, time to dashpot, and total rod drop time.

3) Repeat for all control rods in required conditions of flow and temperature.

4) For each test condition, those control rods whose scram times exceed the two-sigma limit of the scram time data for all control rods, will be retested a minimum of three times.

6. Reactor Coolant System Flow Test

a. Test Objective

1) To measure the RCS flow rate prior to criticality using data obtained from installed elbow tap differential (ΔP) instrumentation.

2) To verify design RCS flow rate using plant calorimetric data prior to escalating above 75 percent power.

b. Acceptance Criteria - Prior to exceeding 75 percent power, the total RCS flow rate determined from calorimetric data must be equal to or greater than the thermal design value specified in the UFSAR.

c. Prerequisites

1) All four RCPs are operating.

2) For the pre-critical measurement, the reactor is in the hot standby condition with all RCCAs at their fully inserted position.

3) For the at-power measurement, reactor power is at the 50 percent power plateau or greater.

d. Method

1) For the pre-critical measurement, RCS cold leg RTD output voltages and loop elbow tap differential pressure (ΔP) signals are used to determine RCS flow rate.

2) For the at-power measurement, plant calorimetric data and hot and cold leg temperatures are used to determine RCS loop flow rates.

7. Reactor Coolant System Flow Coastdown Test

a. Test Objective - This test will determine the delay time associated with assumptions made in the analysis of the loss-of-flow accident by measuring the rate at which reactor coolant flow rate decreases subsequent to a simultaneous trip of all RCPs.

b. Acceptance Criteria

1) The rate of core flow decrease for the first 10 seconds of the transient is slower than that assumed in the UFSAR.

2) The measured Low Flow Trip Time Delay, i.e., the time from when the flow reaches the low flow trip setpoint until the control rods are free to fall, is less than that assumed in the Safety Analysis section of the UFSAR.

c. Prerequisites

1) The reactor is in the hot standby condition with all RCCAs at their fully inserted position.

2) All four RCPs are operating.

3) The RCS flow test has been completed with flow instrumentation calibrated.

4) Pressure-damping devices installed for the flow test have been removed.

d. Method

1) All four RCPs are simultaneously tripped and RCS loop flow data are recorded during the subsequent flow coastdown. The rate of decrease in core flow is then compared to the rate assumed in the safety analysis for the complete loss of flow accident.

2) The Low Flow Trip Time Delay is determined by measuring the time from when the low flow trip setpoint is reached to the time at which the control rods are free to fall.

8. Resistance Temperature Detector Bypass Flow Verification Test (Not Used)

9. Reactor Protection System Trip Circuits Test

a. Test Objective - This test will verify that initial trip setpoint adjustments have been made prior to initial plant startup and specify which trip setpoint adjustments will require readjustment during startup. This test will also verify proper operation of the trip circuitry and will obtain a record of all trip setpoints.

b. Acceptance Criteria

1) Initial reactor trip setpoints are verified to be in conformance with values in the Technical Specifications.

2) Setpoints readjusted during startup and testing are noted, and a final record of all setpoints is obtained.

c. Prerequisites

1) Reactor trip instrumentation has been aligned and calibrated, with setpoints adjusted to values given in the Technical Specifications or the plant test documents.

2) Reactor trip instrumentation has been energized for a time sufficient to achieve stability.

d. Method

1) Input for each automatic and manual trip is simulated, and proper trip response into the protection logic is verified.

2) All combinations of logic are simulated and proper response verified.

3) During startup operations, specific setpoints noted for readjustment on the data sheets are readjusted, and final setpoint values are recorded.

10. Pressurizer Effectiveness Test

a. Test Objective - This test will establish the continuous spray flow rate and will determine the effectiveness of the pressurizer normal control spray and of the pressurizer heaters.

b. Acceptance Criteria

1) For setting of the continuous spray flow, the flow through each bypass valve is adjusted to the minimum spray flow rate which results in a 200°F or less ΔT between the pressurizer and spray lines and which keeps the spray line low temperature alarms clear.

2) For spray and heater response tests, the response to induced transients is compared to the predicted responses in the Westinghouse NSSS startup procedure. Quantitative values for the required convergence of actual test results and predicted values will be specified in the detailed test procedure.

c. Prerequisites

1) The RCS is in hot shutdown condition with normal operating no-load temperature and pressure.

2) All RCPs are operating.

3) All banks of pressurizer heaters are operable.

d. Method

1) Adjust continuous spray valves until a minimum flow is achieved which maintains less than a 200°F temperature difference between the spray line and the RCS and until pressurizer heater cycling is minimized.

2) Check normal control spray effectiveness by spraying down to approximately 2,000 psig.

3) Check heater effectiveness by energizing all heaters with spray valves closed and spray and level controls in manual. Allow pressure to increase to approximately 2,300 psig.

11. Water Quality Test

a. Test Objective - This test will verify the acceptability of water quality of RCS fill and makeup water prior to initial criticality.

b. Acceptance Criteria - All analyses are within the limits specified in the Plant Chemistry Specifications.

c. Prerequisites

1) The RCS is filled and vented in preparation for initial criticality.

2) Reactor Makeup System water storage is at operating level.

3) Boric acid storage tanks are at operating level.

d. Method

1) Sample the RCS and analyze in accordance with approved plant procedures.

2) Sample the Reactor Makeup System and analyze in accordance with approved plant procedures.

3) Sample the boric acid storage tanks and analyze in accordance with approved plant procedures.

12. Zero-Power Physics Tests

a. Test Objective - These tests will verify the basic nuclear characteristics of the reactor core by performing the following measurements:

1) All-rods-out, critical boron concentration

2) Onset of nuclear heat

3) Isothermal temperature coefficient

4) Differential and integral worth of the control rod banks

5) Differential boron worth at HZP

6) Integral control rod worth with one stuck rod

7) Ejected RCCA worth at HZP.

b. Acceptance Criteria

1) The all-rods-out, critical boron concentration is within the limits specified in the fuel vendors' core design report.

2) The isothermal temperature coefficient is negative under all conditions of critical operation.

3) Differential boron worth, over the range measured, is within the values assumed in the UFSAR.

4) Control rod worth measurements verify that the insertion limits defined in the Technical Specifications provide an acceptable shutdown margin under hot shutdown conditions with the most reactive RCCA stuck in the withdrawn position.

5) The worth of an ejected RCCA at HZP is less than or equal to the value used in the safety analyses.

c. Prerequisites

1) The RCS is in the HZP condition with the reactor critical, with the neutron flux level in the source range as established in the initial criticality sequence.

2) RCS temperature is being maintained.

3) Required signals for data collection and recording are available.

d. Method

1) The all-rods-out, critical boron concentration, is determined by measuring the just-critical boron concentration with the last controlling bank near the fully withdrawn position. The amount of reactivity worth of the controlling bank is then dynamically determined by withdrawal of the last bank, measuring the amount of reactivity inserted, and converting this value to an equivalent amount of boron.

2) The neutron flux level will be increased by outward control rod motion until temperature feedback effects are observed. The upper limit for zero-power physics testing is defined as approximately one decade below this level.

3) The isothermal temperature coefficient for various boron concentrations is obtained by dynamically measuring the reactivity change due to a temperature change in the primary system.

4) The control rod bank differential rod worth is determined by either borating the RCS while withdrawing the control banks, or by diluting the RCS while inserting the control banks to maintain nominal system criticality. Integral

worth is then determined from the differential reactivity data. The integral worth will be used to verify the methodology used to predict the most reactive RCCA.

5) Differential boron worth at HZP is determined by obtaining and analyzing reactor coolant samples for boron content in conjunction with control bank movement to maintain nominal criticality during dilution or boration. Boron concentration as a function of time is used to plot reactivity versus boron concentration, the slope of which yields differential boron worth.

6) Integral control rod worth with one stuck rod is measured by achieving a configuration in which all banks are fully inserted, except the most reactive RCCA. Incremental rod worth measurements are made as the banks are inserted during boron dilution. Integral control rod worth is the sum of the incremental reactivity measurements made in obtaining this configuration.

7) Ejected RCCA worth at HZP is determined by obtaining a critical configuration with the sequenced rod 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 fully withdrawn limit.

13. Natural Circulation Verification

a. Test Objective - This test will verify establishment of natural circulation in the primary system.

b. Acceptance Criteria - The primary coolant system can be circulated by natural circulation with no coolant pumps operating.

c. Prerequisites

1) Reactor coolant pumps operating

2) SGs being fed by AFW supply

3) Pressurizer heaters controlling pressure

4) Reactor at approximately 3 percent

5) Normal primary system temperature and pressure

d. Method

Place the plant in natural circulation mode observing the length of time for plant to stabilize, flow distribution, power distribution, and ability to maintain cooling mode. Core exit thermocouples will be monitored to assess core flow distribution.

14. Radiation Survey Test

a. Test Objective - This test will verify shielding effectiveness by measuring neutron and gamma radiation dose levels at selected points throughout the plant.

b. Acceptance Criteria - Measured neutron and gamma radiation levels are within the limits of 10CFR20 for the zone designation of each area surveyed.

c. Prerequisites

1) Reactor is critical at various power levels from zero to 100 percent as specified.

2) Neutron and gamma radiation survey instruments have been calibrated against known sources.

d. Method

1) In accordance with procedures for neutron and gamma radiation surveys, dose levels are measured at points throughout the plant, with the power less than 5 percent.

2) At reactor power levels of approximately 50, 75, and 100 percent, measurements are repeated.

15. Nuclear Instrumentation Calibration Test

a. Test Objective - This test will:

1) Determine the linearity and uniformity of power-range detector output.

2) Calibrate the power-range channels to reflect actual power levels.

3) Determine that excore instrumentation can detect axial flux differences.

4) Obtain Nuclear Instrumentation System channel overlap data.

5) Obtain base line data for fuel pin and core barrel movement using the vibration and loose parts monitoring system.

b. Acceptance Criteria

1) The power-range channels display linear output over the normal operating range.

2) The power-range channels accurately reflect heat balance data.

3) At least one decade of overlap is observed during power-level changes through the source, intermediate, and power ranges.

4) ΔT setpoint adjustments are entered in accordance with the test procedure.

c. Prerequisites

1) The reactor is at the stable, steady-state power level specified by the test procedure.

2) Precritical nuclear and temperature instrumentation calibration has been successfully completed.

d. Method

1) The tests described below are repeated at power levels of approximately 30, 50, 75, and 100 percent:

a) Acceptable power-range output is determined by measuring and plotting power-range detector currents versus power level. From these plots, the linearity of each power-range channel, the degree of uniformity between power-range channels, and the ability of the excore instrumentation to detect axial flux differences are determined.

b) The gain of each power-range channel is adjusted to correspond to the results of the heat balance calculations.

c) Source-, intermediate-, and power-range channel outputs during power-level changes are measured, recorded, and plotted to establish channel overlap.

d) Base line data for fuel pin and core barrel movement is obtained using the core internals channel of the vibration and loose parts monitoring system.

16. <u>Effluent, Process, and Area Radiation Monitor Test</u>

a. Test Objective - This test will verify the performance of the effluent, process, and area monitors under actual operating conditions.

b. Acceptance Criteria

1) The installed effluent and process monitors indicate, as verified by independent laboratory analysis, the radioactive content of the effluent or process fluid.

2) Area radiation monitors properly indicate radiation levels as confirmed by exposure to a check source.

c. Prerequisites

1) The reactor has been operating at the stable, steady-state power level specified in the procedure for a time sufficient to generate representative effluents and process samples.

2) The effluent, process, and area monitors have been calibrated against known sources.

d. Methods - The test described below will be conducted at power levels less than 5 and approximately 30 percent.

1) Following plant procedures, the suitability of effluents for discharge is verified by radiochemical analysis.

2) Discharge is commenced, and the response of effluent monitors is observed and recorded.

3) By radiochemical analysis of the process and effluent samples, confirm the satisfactory performance of the process and effluent monitors.

4) Area radiation monitor detectors will be exposed to check sources in the range of the instrument, to verify detector operability and proper response.

17. Flux Distribution Measurements with Normal Rod Pattern Test

a. Test Objective - This test will verify that the hot-channel factors are less than, or equal to, design safety limits.

b. Acceptance Criteria - Flux distribution measurement analysis yields hot-channel factors less than, or equal to, Technical Specification limits.

c. Prerequisites

1) Reactor is critical at a steady-state power level of less than 5 percent.

2) The Incore Instrumentation System preoperational test is complete, and the system is operable.

3) The computer is operable as required for incore map processing.

d. Method - The reactor power level is stabilized, and complete incore flux maps are obtained and processed.

18. Axial Xenon Oscillation Test (Unit 1 Only)

a. Test Objective - This test will demonstrate the stability of the 3,800 MWT core to axial xenon oscillations.

b. Acceptance Criteria - The reactor core is controllable with respect to xenon oscillations.

c. Prerequisites

1) The reactor is critical at a steady-state power level of approximately 75 percent.

2) Pertinent data to be monitored is specified and connected to recording devices as required by the test procedure.

d. Method

1) Axial xenon oscillations are introduced by a specified maneuvering of control rod banks over a specified time period.

2) Data is recorded and analyzed as required in the test procedure.

19. Power Coefficient Determination Test

a. Test Objective - This test will verify the nuclear design predictions of the ratio of the Doppler-only power coefficient and isothermal temperature coefficient.

b. Acceptance Criteria - The absolute difference between the measured Doppler-only power coefficient verification factor and the fuel vendor's predicted Doppler-only power coefficient verification factor is within 0.53°F/percent power.

c. Prerequisites

1) The reactor is critical at specified power levels from zero to 100 percent.

2) The instrumentation necessary for data collection is installed, calibrated, and operable.

d. Method

1) Turbine load is cycled in increments of several percent. Reactor stability is attained after each power change before performing the next power change.

2) An average measured value of the Doppler-only power coefficient verification factor is obtained from the recorded data and compared to a predicted value based upon design information.

20. Plant Response to Load Changes Test

a. Test Objective - This test will verify the dynamic response of plant system to design load ramp changes.

b. Acceptance Criteria - Successful response of the plant systems to design ramp load changes is delineated below:

1) No reactor trip.

2) No safety injection initiation.

3) No steam line safety or relief valve operation.

4) No pressurizer safety valve operation (all test methods) and no pressurizer relief valve operation (test method d.1).

5) Nuclear power overshoot/undershoot is less than 3 percent for load increase/decrease.

6) No manual intervention required to stabilize plant systems.

7) Plant variables (i.e., T_{avg}, pressure, feed flow, steam flow, etc.) do not incur sustained or diverging oscillations.

c. Prerequisites

1) Reactor is critical at various power levels from 30 to 100 percent as specified.

2) Instrumentation is installed and calibrated for recording specified parameters.

3) All systems are in their automatic mode of operation.

d. Method

1) Step load changes of ±10 percent at 200 percent per minute are introduced at power levels of approximately 30, 50, and 75 percent. A 10-percent-step-load reduction at 200 percent per minute will also be made from 100 percent power.

2) Load reductions of approximately 50 percent are performed from approximately 75 and 100 percent, at 200 percent per minute.

3) Plant trips are performed from power levels up to 100 percent as specified in the procedure.

21. Rod Control System At-Power Test

a. Test Objective - This test will verify the performance of the Rod Control System.

b. Acceptance Criteria - With final setpoints, the Rod Control System provides response in accordance with the STPEGS setpoints documents during a reactor coolant system temperature transient.

c. Prerequisites

1) The reactor is at an equilibrium condition at approximately 30 percent power.

2) The Rod Control System is in manual control, and RCCAs are in the maneuvering band for the existing power level.

3) Signals from parameters affecting automatic control are connected to recorders.

d. Method

1) With the average reactor coolant temperature within ±2°F of the reference reactor coolant temperature, the Rod Control System is placed in automatic.

2) System response is observed during a period sufficient to assure proper control during steady-state conditions.

3) The Rod Control System is placed in manual, and the average reactor coolant temperature is elevated to 6°F greater than the reference reactor coolant temperature.

4) The Rod Control System is returned to automatic, and system response is observed and recorded.

5) With the average reactor coolant temperature initially 6°F lower than the reference reactor coolant temperature, the test is repeated.

6) Setpoints are adjusted as necessary, and the test is repeated.

22. Evaluations of Core Performance Test

a. Test Objective - This test will verify that core performance margins are within design predictions for expected normal and abnormal rod configurations.

b. Acceptance Criteria - Sufficient data has been collected so that the following core performance margins can be established to be within safety analysis predictions:

1) Flux distributions

2) Local surface heat flux

3) Linear heat rate

4) Departure from nucleate boiling ratio (DNBR)

5) Radial and axial power peaking factors

6) Quadrant power tilt

c. Prerequisites

1) Reactor is critical at various power levels from zero to 100 percent as specified.

2) Data-recording instrumentation is calibrated and operable.

d. Method

1) At steady-state power points of approximately 30, 50, 75, 90 and 100 percent, incore data are obtained and analysis is performed.

2) Data or measurements to be recorded include:

a) Power-range detector currents versus power level

b) Secondary heat balance and adjustment of power-range channel gain

c) RTD values and ΔT amplifier outputs

d) Excore detector signal voltages versus currents

e) Overlap data for power and intermediate ranges

f) Data for calibration of steam and FW flow instruments

23. Full Load Rejection Test

a. Test Objective - This test will demonstrate the ability of the plant to sustain a trip of the main generator from 100 percent and to evaluate the interaction between control systems and system responses to the transient.

b. Acceptance Criteria

1) SI is not initiated.

2) Main steam and pressurizer safety valves do not lift.

3) Recorded parameters and observed transient results are compared to the predicted results. Quantitative values for the required convergence of actual test results and predicted values will be provided in the detailed test procedure.

4) No safety limits are exceeded.

c. Prerequisites

1) Specified control systems are in the automatic mode and functioning properly.
2) The reactor is at steady-state full power with the rods in the maneuvering band.

3) Pressurizer and main steam safety relief valves are operable.

4) Parameters to be connected to recording devices will be specified in the detailed test procedure and will include:

a) Nuclear flux

b) Cold leg temperature

c) Hot leg temperature

d) T_{avg}

e) Pressurizer level

f) Pressurizer pressure

g) Steam pressure

h) SG levels

d. Method

1) The main generator is manually tripped such that it is subjected to the maximum credible overspeed condition.

2) During the transient, the following control functions will be observed:

a) Rod Control System

b) Reactor Protection System

c) Pressurizer Pressure Control System

d) SG Level Control System

e) Steam Dump Control System

3) Following the transient, recorded data and control function response are evaluated and compared to the predicted results.

24. <u>Loss of Offsite Power Test</u>

a. Test Objective - This test will verify that, upon a LOOP, the plant can be maintained in a hot standby condition in natural circulation for approximately 30 minutes.

b. Acceptance Criteria

1) Turbine and reactor trips function as described in the UFSAR.

2) Emergency power systems function as described in the UFSAR.

3) The plant is operated in a stable condition in natural circulation, using batteries and emergency diesels.

c. Prerequisites

1) The plant is at a steady-state power level equal to or greater than 10 percent of rated generator load.

2) Pressurizer and main steam safety and relief valves are operable.

3) Pertinent parameters to be measured are connected to recording devices.

d. Method

1) The unit is isolated from the Offsite Power Distribution System.

2) Starting of the emergency diesels, stripping of vital buses, and sequencing of emergency loads on the vital buses are observed for proper operation, and the plant is maintained in a natural circulation condition for approximately 30 minutes.

25. <u>Shutdown from Outside the Control Room Test</u>

a. Test Objective - This test will demonstrate the capability to shut down the unit and maintain hot standby from outside the control room.

b. Acceptance Criteria

1) The reactor trips.

2) The turbine generator trips.

3) A stable hot standby condition is established and maintained for at least 30 minutes.

c. Prerequisites

1) Control systems are functioning properly.

2) Turbine generator power output is equal to or greater than 10 percent.

3) All required communications circuits are operational.

4) Approved operating procedures for performing a safe shutdown from outside the control room, and approved procedures for conducting this test, shall be available.

d. Method

1) Evacuation of the main control room is simulated by dispatching personnel (not to exceed a minimum shift crew) to the safe shutdown control stations while additional operators occupy the control room to observe plant behavior.

2) The reactor is tripped at the reactor trip switchgear.

3) The plant is maintained in the hot standby condition by manipulation of safe shutdown controls and observation of safe shutdown indications for at least 30 minutes. During this demonstration, only that equipment for which credit would be taken for performing an actual safe shutdown will be used.

26. Dynamic Rod Drop Test

a. Test Objective - This test will verify the operation of the negative rate trip circuitry in detecting the simultaneous insertion of two RCCAs.

b. Acceptance Criteria

1) The reactor trips as a result of the negative rate trip.

2) SG and pressurizer safety valves do not lift.

3) SI is not initiated.

c. Prerequisites

1) All power-range nuclear instrumentation channels are operable.

2) The reactor is at the steady-state power level of approximately 50 percent with the controlling bank near the full-power-insertion limit.

3) Pertinent parameters to be measured are connected to recorders.

d. Method

1) Two of the least reactive rods from the group most difficult to detect by excore detectors, due to low worth and core location, are simultaneously dropped by removing voltage to both the moveable and stationary gripper coils of the designated rods.

2) Following the transient, recorded data is evaluated for system and instrumentation response.

27. Static RCCA Drop and RCCA Below-Bank Position Measurements Test

a. Test Objective - This test will obtain the differential and integral worth of the most reactive below-bank RCCA, will demonstrate the response of the nuclear incore instrumentation to a RCCA below the nominal bank position, and will determine hot-channel factors associated with this misalignment.

b. Acceptance Criteria

1) Hot-channel factors are within UFSAR safety limits when the unit RCCA is completely misaligned.

2) The excore and/or incore instrumentation will detect a misaligned RCCA when the misalignment is outside the Technical Specification limits.

3) Misalignment within the limits of the rod position indicators will not cause a power mal-distribution outside the Technical Specification limits.

4) A three percent reduction in rated thermal power for each percent tilt, for tilts in excess of that allowed by the Technical Specifications, maintains $F_Q(Z)$ within the allowed value in the Technical Specifications.

c. Prerequisites

1) All power-range nuclear instrumentation channels are operable.

2) Incore instrumentation is operable.

3) The reactor is at a steady-state power level of approximately 50 percent.

d. Method

1) Single rod movement is accomplished by disconnecting the lift coils of all rods in the affected bank except the selected rod. A high worth RCCA will be selected.

2) The differential worth of the rod is determined by making a series of step adjustments in rod position to maintain nominal system criticality during a continuous, controlled RCS dilution. The flux level response to the step change in reactivity is translated to equivalent reactivity. Differential and integral worths are calculated from this reactivity.

3) During rod insertion, power-range detector currents, thermocouple maps, and incore detector traces are periodically recorded.

4) The power-range detector data provides information to relate core quadrant tilt to rod position.

5) The thermocouple maps, in conjunction with moveable incore detector traces, provide data necessary to determine hot-channel factors and core axial and radial power distributions as a function of rod position.

6) The rod will be returned to its proper bank position and all lift coils will be reenergized.

28. Pseudo Rod Ejection Test (Unit 1 Only)

a. Test Objective - This test will verify hot-channel factors assumed in the safety analysis and will demonstrate the response of nuclear and incore instrumentation to an RCCA above the nominal bank position and to an ejected rod.

b. Acceptance Criteria

1) The hot-channel factors, with measurement uncertainty, are less than or equal to those assumed in the safety analysis.

2) The excore and/or incore instrumentation will detect a misaligned RCCA when the misalignment is outside the Technical Specifications limits.

3) The maximum hot channel factor, when adjusted for uncertainty, is ≤ 7.10 when the pseudo ejected rod is completely withdrawn.

c. Prerequisites

1) All power-range nuclear instrumentation channels are operable.

2) Incore instrumentation is operable.

3) Reactor is critical at a steady-state power level of approximately 30 percent with the controlling bank at approximately the full-power-insertion limit.

d. Method

1) Single rod movement is accomplished by disconnecting the lift coils of all rods in the affected bank except the selected rod.

2) A series of step adjustments in rod position will be performed to maintain nominal system criticality during a continuous, controlled RCS boration.

3) During rod withdrawal, power-range detector currents, thermocouple maps, and incore detector traces are periodically recorded.

4) The power-range detector data provides information to relate core quadrant tilt to rod position.

29. Chemistry and Radiochemistry Test

a. Test Objective - This test will demonstrate that the chemical and radiochemical requirements of the RCS and the secondary coolant system can be maintained in accordance with Technical Specification requirements.

b. Acceptance Criteria - measured primary and secondary coolant chemistry and radiochemistry are within the limits required by Technical Specifications at 0, 30, 50, 75, and 100 percent power.

c. Prerequisites

1) CVCS is lined up for normal operation.

2) The primary sampling system is operable.

3) SG blowdown is lined up for normal operation.

4) The reactor is at the specified steady-state power level.

d. Method

1) The primary system chemistry will be monitored for those parameters required by Technical Specifications at 0, 30, 50, 75, and 100 percent.

2) SG blowdown will be monitored to detect any activity in the secondary system.

30. <u>Reactor Coolant System Loose Parts Monitoring Test</u>

a. Test Objective - This test will provide base line data for the RCS loose parts monitoring system (LPMS).

b. Acceptance Criteria - Base line data obtained for all channels of the LPMS at power levels of approximately 30, 50, 75, and 100 percent.

c. Prerequisites

1) Reactor is at the stable, steady-state power level specified by the test procedure.

2) Instrumentation necessary for data collection is installed, calibrated, and operable.

d. Method - With the reactor power at the prescribed power levels, LPMS base line data will be obtained at center frequencies of 25 Hz, 250 Hz, 2.5 kHz and 25 kHz.

31. <u>Feedwater Temperature Reduction Test</u>

a. Test Objective - To demonstrate that the dynamic response of the plant is in accordance with design for the bypassing of the high pressure FW heaters.

b. Acceptance Criteria - The reduction in FW temperature will result in an increase in heat load on the primary coolant side of less than 10 percent of full power.

c. Prerequisites

1) The reactor is operating at the steady-state power level of approximately 50 and 90 percent, as specified in the approved test procedure.

2) Pertinent parameters to be measured are connected to recorders.

d. Test Method

1) The high pressure heater bypass valve is opened to cause a reduction in FW temperature.

2) Following the increased power transient, recorded data are evaluated for plant response.

32. Automatic Steam Generator Level Control Test

a. Test Objective - This test will demonstrate the ability of the FW system and FW heater and heater drip systems to perform their design functions by performing the following testing:

1) Demonstrate the proper operation of the turbine-driven FW pumps and the pumps speed controllers.

2) Demonstrate the level control stability of the SG FW bypass valves.

3) Demonstrate the stability of the SG level control when transferring control from the flow bypass valves to the main FW valves.

4) Demonstrate proper response of the automatic SG level control system during plant transients at power levels of approximately 20, 30, 50, 75, and 100 percent.

5) Verify proper automatic programming of the SG level during power escalation.

6) Demonstrate proper operations of the heater drip system by placing it in service at the appropriate design power level.

b. Acceptance Criteria

1) The FW pumps meet or exceed flow and pressure requirements of Section 10.4.7.

2) The FW pumps discharge pressure oscillations are within the allowable limits of Section 10.4.7 in automatic speed control.

3) The main FW control valve stem positions shall stabilize within limits of Section 10.4.2 for the various steam flow conditions.

4) SG level overshoot or undershoot must be less than the limit in Section 7.7.1.7 following a level increase or decrease.

5) SG level should return to, and remain within, a design limit of the reference value of Section 7.7.1.7 following a transfer of level controls from manual to automatic.

6) SG level should return to, and remain within, the design limit of the level setpoint shown in the STPEGS setpoints documents following a level or level setpoint change.

7) The FW heaters function as described in Section 10.4.7.

8) The heater drip pumps meet the flow and pressure requirements of Section 10.4.7.

c. Prerequisites

1) All FW system and heater drip system instrumentation has been calibrated and is operable.

2) Reactor is critical at a 5 to 10 percent power level.

3) Turbine generator is on steam slow roll.

4) The RCS is initially in manual control.

5) The variable speed FW pump speed controller is in manual control.

6) The instrumentation required for data collection is installed, calibrated, and operable.

7) The FW pumps are operating in the recirculation mode.

d. Method

1) For each individual SG, with the level controller in automatic, either raise the setpoint approximately 5 percent above and lower it back to the normal operating level setpoint, or lower the setpoint approximately 5 percent below and raise it back to the normal operating level setpoint, and verify the ability of the controller to control the water level and its stability.

2) With all SG level controls in automatic, increase power to approximately 20 percent and verify level is controlled to the proper level.

3) Individually transfer each SG FW bypass valve to the main FW control valve and verify it controls the SG level at its proper level.

4) At the appropriate design power level, place the heater drip system in operation and verify it performs per design requirements.

5) When power level is increased to 30 percent, verify that the FW pump discharge pressure versus the steam header pressure is maintained at the correct pressure difference for each of the FW pumps, one at a time; verify that each pump's automatic speed controller is stable within design limits and that the level controller response performs per design requirements in conjunction with Startup Test Procedure No. 20 (Plant Response to Load Change Test - Method d.1).

6) Verify that the FW pump speed controller and the SG level controller provide system response and stability within design requirements in conjunction with Startup Test Procedure No. 20 (Plant Response to Load Change Test - Method d.1) at power levels of 50, 75, and 100 percent.

7) Verify that the FW pump speed controller and SG level controller provide system response and stability within design requirements in conjunction with Startup Test Procedure No. 20 (Plant Response to Load Change Test - Method d.2) at power levels at 75 to 100 percent.

33. <u>Control of Margin to Saturation Test</u>

a. Test objective - This test will:

1) Determine the depressurization rate of the RCS without pressurizer heaters.

2) Determine the depressurization rate of the RCS with auxiliary spray.

3) Measure the effect of changes in charging flow on temperature saturation (T_{sat}).

4) Measure the effect of changes in steam flow on T_{sat}.

b. Acceptance criteria

1) The RCS depressurization rate following loss of pressurizer heaters is determined. (Reference Section 7A.I.G.1)

2) The effects of charging flow and steam flows on saturation margins are demonstrated. (Reference Section 7A.I.G.1)

c. Prerequisites

1) The RCS is in the shutdown condition with normal operating no-load temperature pressure.

2) Two RCPs in operation (RCPs are not to be in loops with pressurizer surge line or spray lines.)

d. Method

1) Reduce pressure by turning off pressurizer heaters, noting depressurization rate.

2) Reestablish heaters and reduce pressure further by use of auxiliary spray, noting depressurization rate and effect upon margin to saturation temperature.

3) At reduced pressure, observe the effects of changes in charging flow and steam flow on margin to saturation temperature.

14.3 ADDITIONAL TESTING FOR REPLACEMENT STEAM GENERATORS

This section describes the Return to Service test program for the Replacement Steam Generators.

14.3.1 Summary of Test Program and Objectives

The objective of the Return to Service test program for the Replacement Steam Generators is to demonstrate that the Replacement Steam Generators and associated structures, systems, and components perform satisfactorily in service. Return to Service testing commences at the completion of the Replacement Steam Generator installation and continues through completion of the test program at full power.

14.3.2 Organization and Staffing

A team representing a cross section of station personnel with support from vendors manages and executes the Return to Service test program for the Replacement Steam Generators.

14.3.3 Test Procedures

Test procedures are developed using station administrative programs.

14.3.4 Conduct of the Test Program

Tests are conducted in accordance with station administrative programs.

14.3.5 Review, Evaluation, and Approval of Test Results

Test results are reviewed, evaluated and approved as stated in the approved procedures. Deficiencies are handled in accordance with the corrective action program.

14.3.6 Test Records

Test procedures and all information specifically called for in that procedure, such as completed data sheets, tables, logs, chart recordings etc., are included with the test package as applicable. All completed test packages become a part of the plant's historical record and are maintained at the facility in accordance with administrative procedures and requirements for record retention.

14.3.7 Conformance of Test Program with Regulatory Guides

There are no specific Regulatory Guides applicable to the Return to Service test program for the Replacement Steam Generators. Applicability of Regulatory Guides to STPEGS is summarized in Section 3.12.

14.3.8 Development of the Test Program

The Return to Service test program was developed based on inputs such as the current licensing basis requirements, the FSAR Initial Plant Test Program, procedures prepared for other utilities which have replaced steam generators, recommendations of the Replacement Steam Generator supplier, and other documents associated with the Replacement Steam Generators. A comparison of Replacement Steam Generator Return To Service Tests with Initial Startup Tests is in Table 14.3-1.

14.3.9 Test Program Schedule

Test program activities are scheduled as part of the refueling outage in which the steam generators are replaced.

14.3.10 Individual Test Descriptions

The following are descriptions of tests performed for Steam Generator Replacement that are not normally performed for a post refueling startup.

14.3.10.1 Thermal Expansion Test.

a) Test Objective - To verify by visual observation, measurement, and evaluation that specified Replacement Steam Generator components and connected piping are free to expand without restriction of movement.

b) Acceptance Criteria - The equipment, piping and components addressed in the procedure are verified to expand during heat-up without obstructions or restrictions. All piping and components shall not cause interferences with surrounding equipment, supports, restraints, or structures. Thermal movements for each support, restraint, and/or component shall be within the anticipated ranges or evaluated as acceptable.

c) Prerequisites - Replacement Steam Generators and associated components and connected piping are installed to the extent necessary to permit testing.

d) Method - Observation, measurement, and evaluation of specified Replacement Steam Generator components and connected piping is made at ambient conditions, approximately 180^{o}F, and at approximately 567^{o}F.

14.3.10.2 Vibration Monitoring Test.

a) Test Objective - To demonstrate that specified Replacement Steam Generator components and connected piping are within acceptable limits at operating conditions.

b) Acceptance Criteria - The equipment, piping and components addressed in the procedure have vibration levels within limits specified in applicable codes.

c) Prerequisites - Replacement Steam Generators and associated components and connected piping are installed to the extent necessary to permit testing.

d) Method - Observation, measurement, and evaluation of specified Replacement Steam Generator components and connected piping vibration is performed during operation.

14.3.10.3 Steam Generator Blowdown Recirculation Test.

a) Test Objective - To demonstrate that the Steam Generator Blowdown Recirculation system operates as designed following the changes in piping made due to Steam Generator Replacement.

b) Acceptance Criteria - The Steam Generator Blowdown Recirculation system operates as designed.

c) Prerequisites - Replacement Steam Generators are filled with the amount of water necessary to permit testing.

d) Method - Data is collected during operation of the Steam Generator Blowdown Recirculation system and evaluated to verify that the system can be operated as designed.

14.3.10.4 Reactor Coolant System Flow Verification.

a) Test Objective - To measure the RCS flow rate prior to criticality using data obtained from installed elbow tap differential pressure (ΔP) instrumentation.

b) Acceptance Criteria - RCS flow rate is greater than the minimum required.

c) Prerequisites - All four RCPs are operating with the reactor in hot standby condition.

d) Method - RCS cold leg temperatures and loop elbow tap differential pressure (ΔP) signals are used to determine RCS flow rate.

14.3.10.5 Low Power Steam Generator Water Level Control Test.

a) Test Objective - To demonstrate the ability of the low power steam generator level control system to control at steady state power and to demonstrate the ability of the low power steam generator level control system to respond to a mismatch between steam generator level and setpoint.

b) Acceptance Criteria - The actual steam generator levels are within specified limits of the programmed values. Steam generator level automatically returns to and remains within design limits of the level setpoint following a level setpoint change.

c) Prerequisites - Power is stable at the level specified in the test procedure.

d) Method - Data is collected and evaluated during steady state operation. For each steam generator, a -5% level setpoint change is initiated and response of the level control system is monitored. A +5% level setpoint change is initiated and response of the level control system is monitored.

14.3.10.6 Calibration of Steam Flow Transmitters.

a) Test Objective - To verify the calibration of steam flow transmitters.

b) Acceptance Criteria - The difference between transmitter steam flow and actual steam flow is within the specified limits.

c) Prerequisites - Power is stable at approximately 50%, 75% and 100%.

d) Method - Data is collected and used to verify proper scaling of steam generator steam flow instrumentation. Transmitter calibrations are performed, as necessary, to normalize steam flow with feed flow.

14.3.10.7 Steam Generator Water Level Control Test.

Test Objective - To demonstrate proper operation of the turbine-driven feedwater pumps and the pumps speed controllers at steady state power, to demonstrate the ability of the steam generator level control system to control at steady state power and to demonstrate the ability of the steam generator level control system to respond to a mismatch between steam generator level and setpoint.

a) Acceptance Criteria - The actual steam generator levels and feedwater to steam header delta pressure are within specified limits of the programmed values. The main feedwater regulating valve positions are between the maximum and minimum valve position curves specified for the test. Steam generator level automatically returns to and remains within design limits of the level setpoint following a level setpoint change.

b) Prerequisites - Power is stable at the level specified in the test procedure.

d) Method - Data is collected and evaluated during steady state operation. For each steam generator, a -5% level setpoint change is initiated and response of the level control systemis monitored. A +5% level setpoint change is initiated and response of the level control system is monitored.

14.3.10.8 Load Swing Test.

a) Test Objective - To demonstrate the ability of the plant to sustain an approximate 10% power load reduction.

b) Acceptance Criteria - Successful response of the plant systems to step load changes is delineated as follows:

1) No reactor trip.
2) No safety injection initiation.
3) No steam line safety or relief valve operation.
4) No pressurizer safety valve operation and no pressurizer relief valve operation.
5) Nuclear power overshoot/undershoot is less than 3 percent for load increase/decrease.
6) No manual intervention required to stabilize plant systems.
7) Plant variables (i.e., Tavg, pressure, feed flow, steam flow, etc.) do not incur sustained or diverging oscillations.

c) Prerequisites - Power is stable at the level specified in the test procedure.

d) Method -Step load change of approximately -10% at 200% per minute is introduced, plant parameters are monitored and results evaluated.

14.3.10.9 Large Load Reduction Test.

a) Test Objective - To demonstrate the ability of the plant to sustain an approximate 25% power load reduction.

b) Acceptance Criteria - Successful response of the plant systems to a step load change is delineated as follows:

1) No reactor trip.
2) No safety injection initiation.
3) No steam line safety or relief valve operation.
4) No pressurizer safety valve operation.
5) Nuclear power overshoot/undershoot is less than 3% for load increase/decrease.
6) No manual intervention required to stabilize plant systems.
7) Plant variables (i.e., Tavg, pressure, feed flow, steam flow, etc.) do not incur sustained or diverging oscillations.

c) Prerequisites - Power is stable at the level specified in the test procedure.

d) Method - Step load change of approximately -25% at 200% per minute is introduced, plant parameters are monitored and results evaluated.

14.3.10.10 Steam Generator Thermal Performance Test.

a) Test Objective - To verify the performance of the Replacement Steam Generators at or near full power.

b) Acceptance Criteria - Measured parameters meet or exceed the values specified in the test procedure.

c) Prerequisites - Power is stable at approximately 100%.

d) Method - Data is collected and used to verify the performance of the Replacement Steam Generators.

TABLE 14.3-1

COMPARISON OF REPLACEMENT STEAM GENERATOR RETURN TO SERVICE TESTS WITH INITIAL STARTUP TESTS

FSAR 14.2.12.3 Test Summary No.	Test Title	Test Comparison
1.	Moveable Incore Detector Test	Not affected by Steam Generator Replacement
2.	Rod Position Indication Test	Not affected by Steam Generator Replacement
3.	Rod Control System Alignment Test	Not affected by Steam Generator Replacement
4.	Rod Drive Mechanism Timing Test	Not affected by Steam Generator Replacement
5.	Rod Drop Time Measurement	Affected due to change in RCS Flow. Testing performed in accordance with Technical Specification surveillance.
6.	Reactor Coolant System Flow Test	Affected due to change in RCS Flow. Precritical flow measured and transmitter calibration adjusted as necessary. Post critical test performed in accordance with Technical Specification surveillance.
7.	Reactor Coolant System Flow Coastdown Test	Loss of Forced Reactor Coolant Flow (Section 15.3.2) is not affected by Steam Generator Replacement.
8.	Resistance Temperature Detector Bypass Flow Verification Test (Not Used)	Not affected by Steam Generator Replacement
9.	Reactor Protection System Trip Circuits Test	Changes in setpoints tested in accordance with Technical Specification surveillance.
10.	Pressurizer Effectiveness Test	Continuous pressurizer spray valves have their position adjusted each heatup per normal operating procedure. Spray effectiveness is increased and heater effectiveness is unchanged so no test is needed.

TABLE 14.3-1 (continued)

COMPARISON OF REPLACEMENT STEAM GENERATOR RETURN TO SERVICE TESTS WITH INITIAL STARTUP TESTS

FSAR 14.2.12.3 Test Summary	Test Title	Test Comparison
11.	Water Quality Test	Not affected by Steam Generator Replacement
12.	Zero-Power Physics Tests	Not affected by Steam Generator Replacement
13.	Natural Circulation Verification	Analysis indicates Natural Circulation capability is actually slightly enhanced, therefore no test is required to demonstrate.
14.	Radiation Survey Test	Radiation surveys are performed per normal Radiation Protection procedures.
15.	Nuclear Instrumentation Calibration Test	Not affected by Steam Generator Replacement
16.	Effluent, Process, and Area Radiation Monitor Test	Not affected by Steam Generator Replacement
17.	Flux Distribution Measurements with Normal Rod Pattern Test	Not affected by Steam Generator Replacement
18.	Axial Xenon Oscillation Test (Unit 1 Only)	Not affected by Steam Generator Replacement
19.	Power Coefficient Determination Test	Not affected by Steam Generator Replacement
20.	Plant Response to Load Changes Test	a) Approximate 10% step load reduction performed at least once per 85% and 100% power b) Load reduction of between 20% and 50% performed at least once per between 75% and 100% power. c) Plant trip not performed. A plant trip is not necessary or desirable since the analytical results for a turbine trip (Section 15.2.4) are not significantly different for Model Delta 94 Steam Generators compare to Model E Steam Generators.
21.	Rod Control System At-Power Test	Not affected by Steam Generator Replacement

TABLE 14.3-1 (continued)

COMPARISON OF REPLACEMENT STEAM GENERATOR RETURN TO SERVICE TESTS WITH INITIAL STARTUP TESTS

FSAR 14.2.12.3 Test Summary	Test Title	Test Comparison
22.	Evaluations of Core Performance Test	Not affected by Steam Generator Replacement
23.	Full Load Rejection Test	Plant trip not performed. A plant trip is not necessary or desirable since the analytical results for a turbine trip (Section 15.2.4) are not significantly different for Model Delta 94 Steam Generators compare to Model E Steam Generators.
24.	Loss of Offsite Power Test	See Test Summary 13
25.	Shutdown from Outside the Control Room Test	Not affected by Steam Generator Replacement
26.	Dynamic Rod Drop Test	Not affected by Steam Generator Replacement
27.	Static RCCA Drop and RCCA Below-Bank Position Measurements Test	Not affected by Steam Generator Replacement
28.	Pseudo Rod Ejection Test (Unit 1 Only)	Not affected by Steam Generator Replacement
29.	Chemistry and Radiochemistry Test	Not affected by Steam Generator Replacement
30.	Reactor Coolant System Loose Parts Monitoring Test	Loose Parts Monitoring testing is performed per existing programs at each post refueling startup.
31.	Feedwater Temperature Reduction Test	Not affected by Steam Generator Replacement
32.	Automatic Steam Generator Level Control Test	Tests are performed on Steam Generator level control and feed pump speed control for stability and capability to respond to level and power changes.
33.	Control of Margin to Saturation Test	Not affected by Steam Generator Replacement