SECTION 14

INITIAL TEST PROGRAM

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SECTION 14

INITIAL TEST PROGRAM

14.1 SPECIFIC INFORMATION INCLUDED IN THE PRELIMINARY SAFETY ANALYSIS REPORT

The objectives of the initial test program were previously provided in the PSAR.

14.2 CONSTRUCTION VERIFICATION, PREOPERATIONAL, AND POWER TEST PROGRAM

14.2.1 Summary of Test Program and Objectives

The test and startup program consists of three phases: the Phase I construction verification test program, the Phase II preoperational test program, and the Phase III power test program. These programs are summarized below.

14.2.1.1 Construction Verification Test Program - Phase I

The construction verification test program commences during and immediately following construction. The program includes static and dynamic tests, calibration, initial energization, functional checks, hydrostatic tests, meggering of cables/equipment and flushing or cleaning of oil systems. Construction verification tests are performed under the direction of PSE&G and/or Bechtel Construction, Inc. Upon completion of required construction verification testing on a system, applicable documentation is completed and the system is jurisdictionally turned over to the Public Service Startup Group (PSSUG).

The objective of this program is to verify proper installation of structures, components, and equipment in accordance with design specifications.

Snubbers installed on safety related systems, and snubbers installed on non-safety related systems whose failure or failure of the system on which they are installed would adversely affect any safety related system; will utilize final construction Quality Control inspection records for the pre-service inspection baseline records.

The final construction Quality Control inspection records for all of these snubbers shall, as a minimum, specifically address verification of the following:

1. There are no visible signs of damage or impaired operability as a result of storage, handling or installation.

2. The snubber location, orientation, position setting, and configuration (attachments, extensions, etc.) are according to design drawings and specifications.

3. Snubbers are not seized, frozen or jammed by manually stroking all snubbers regardless of size. The mechanical snubbers installed in systems will be stroked just prior to room/area turnover from construction to PSE&G startup. At this time access to these areas is restricted and limited to support of startup program which minimizes the possibility of snubber damage due to construction activities.

4. Adequate swing clearance is provided to allow snubber movement.

5. For hydraulic snubbers, that fluid is to the recommended level and is not leaking from the snubber system.

6. Structural connections such as pins, fasteners, and other connecting hardware such as lock nuts, tabs, wire, cotter pins are installed correctly.

14.2.1.1.1 Exceptions to the Phase I Program

Certain systems or equipment will neither be energized or calibrated until jurisdiction has been transferred to PSE&G via a component/system turnover. In such cases, the component/system turnover will occur immediately upon construction completion of non-energized testing activities.

Such exceptions are essential to provide PSE&G with maximum time for testing, training and procedural development on systems and

equipment whose function or operation is highly complex or proprietary.

14.2.1.2 <u>Preoperational Test Program - Phase II</u>

This program begins with component/system turnover to the PSSUG and terminates with commencement of initial fuel load. It consists of two parts: the initial system operating phase, and the system and integrated testing phase.

1. Initial System Operating Phase

   During this phase, the PSSUG directs all activities including operational energization of systems, run-in of pumps, verification flushing and chemical cleaning of piping, and implementation of programs for preventive maintenance and system layup.

   The objective of this phase is to accomplish a controlled, orderly, and safe initial startup and operation of systems and subsystems, in support of ongoing testing and to prepare for subsequent system and integrated testing activities.

2. System and Integrated Testing Phase

   During this phase, PSSUG performs preoperational test procedures on individual and integrated systems. Additionally, baseline data for inservice inspections are completed, operating and surveillance procedures are finalized, and access control is established. Testing and operator training applicable to the preoperational test program and related to the BWROG response to NUREG 0737, Item I.G.1, will be accomplished during this phase.

   To the extent practicable, the objectives of this phase are to:

a. Verify the capability of structures, components, and systems to satisfy their design intent

b. Verify that plant construction is in accordance with design specification

c. Familiarize plant operating, technical, and maintenance personnel with plant operation

d. Confirm the adequacy of plant operating and surveillance procedures.

When snubber installation and final construction Quality Control inspection per Section 14.2.1.1 precedes the start of initial fuel load by six months or more, those snubbers will be re-examined prior to fuel load to verify the following:

(1) That there is no visable damage or impairment to operability as a result of storage, handling or installation.

(2) That adequate swing clearance is provided to allow snubber movement.

(3) For hydraulic snubbers, that fluid is to the recommended level and is not leaking from the snubber system.

Snubbers which are found to be installed incorrectly or otherwise fail to meet the re-examination requirements shall be repaired or replaced and re-examined in accordance with the criteria delineated in Section 14.2.1.1.

14.2.1.3 Power Test Program - Phase III

The power test program is performed by the Nuclear Department, Hope Creek Operations (plant staff). The program commences with the start of nuclear fuel loading and terminates with the completion of power ascension testing. Formal tests, denoted as startup tests, are conducted during this program. These tests confirm the design basis and demonstrate, to the extent practicable, that the plant operates and responds to anticipated transients and postulated accidents as designed. Startup testing is sequenced to ensure that plant safety is not dependent upon the performance of untested structures, systems, or components. Testing and operator training applicable to the startup test program and related to the BWROG response to NUREG 0737, Item I.G.1, will be accomplished during this phase.

The objectives of the power test program are to:

1. Accomplish a controlled, orderly, and safe initial core loading.

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

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

4. Demonstrate that the plant operates in accordance with design, both during normal steady state conditions and where practical during and following anticipated transients.

5. Evaluate and demonstrate, to the extent possible, plant operating procedures, to ensure that the plant staff is knowledgeable about the plant and procedures, and is fully prepared to operate the facility in a safe manner.

6. Bring the plant to rated capacity and sustained power operation.

14.2.2 Organization

Public Service Electric and Gas Company (PSE&G) has overall responsibility for the test and startup program through Phases I, II, and III. This responsibility is executed by the Engineering and Construction Department in Phase I. Phase II will be a shared responsibility between E&C and Nuclear Departments. The shift in responsibility to Nuclear Department will occur when sufficient preoperational tests are being conducted and operations is made active and better integrated into daily operations within the Phase II test program. The Nuclear Department, Hope Creek Operations is responsible for Phase III.

14.2.2.1 Phase I Organization

The Phase I construction verification test program is delegated to Bechtel Construction Inc. They shall establish, within their defined scope of responsibility, the quality assurance (QA) and quality control (QC) programs and administrative/technical procedures required to support corporate commitments and project schedule. They shall coordinate and direct, through their established organizational structures, all parties participating in specific activities of this test program. Public Service Startup Group (PSSUG) personnel are used in the performance of energized tests and calibrations.

14.2.2.2 Phase II Organization

The Phase II preoperational test program is conducted by the PSSUG under the direction of the Startup Manager. This group is staffed with personnel from the following participating parties:

1. Engineering and Construction Department

2. Nuclear Department

3. General Electric

4. Bechtel Construction Inc.

5. Other contractors.

14.2.2.2.1 Startup Manager

The Startup Manager is head of the PSSUG and reports to the Project Completion Manager. Within his defined scope, he establishes the programs and administrative/technical procedures required to conduct the Phase II preoperational test program in accordance with corporate commitments and project schedule. He shall coordinate and direct, through established organizational structures, all parties participating in this test program. Figure 14.2-1 illustrates the PSSUG organization.

14.2.2.2.1.1 Startup Director

The Startup Director is a line function and reports to the Startup Manager as specifically delegated by the Startup Manager.

14.2.2.2.2 Principal Startup Engineer - Testing

The Principal Startup Engineer - testing has primary responsibility for the performance of field test and startup activities. In this capacity, he:

1. Establishes priorities

2. Allocates test personnel

3. Coordinates the support of participating parties

4. Coordinates resolution of field testing related problems.

In implementing this responsibility, he directs assigned group leaders, test engineers, and technical craft personnel.

14.2.2.2.3 Principal Startup Engineer - Methods/Administration

The Principal Startup Engineer - methods/administration has primary responsibility for all support functions. In this capacity, he:

1. Develops and implements control programs for:

    a. Cost, planning, and scheduling

    b. Personnel training and certification

    c. Deficiency tracking

    d. Administrative and technical procedure review/approval

    e. Material and test equipment

    f. Vendor services

2. Coordinates resolution of support related problems

3. Provides test and startup technical support and assistance, as required.

In implementing this responsibility, he directs assigned group leaders and personnel.

14.2.2.2.4 Preop Control Group

The PREOP Control Group is responsible for Preoperational Test development and control. In this capacity, the group's responsibilities include:

1. Develop preoperational test procedures, coordinate the procedure review, resolution of comments, and acquire procedure approval.

2. Convene the Test Review Board, TRB, to perform a technical review of the adequacy of the test procedure and resolve comments on the test procedure acquired during the procedure review cycle.

3. Coordinate release of the PTP for field testing.

4. Coordinate the PTP results review

5. Coordinate the system "Release From Test" to the Hope Creek Nuclear Dept.

14.2.2.2.5 Quality Assurance Startup Engineer (QASE)

The Quality Assurance Startup Engineer performs a staff function to PSSUG. He is assigned to the Public Service Quality Assurance Department to which he is technically and administratively responsible. He will identify to the Startup Manager, or his designee, all quality related problems associated with Q/F-listed activities. His responsibilities include:

1. Liaison with the Startup Manager, or his designee, on quality matters

2. Performance of surveillance on PSSUG test and startup activities

3. Technical procedure review, including designation of mandatory witness points in conjunction with the cognizant startup engineer

4. Performance of mandatory witness points

5. Review of deficiency reports generated by PSSUG following initiation and disposition

6. Review and approval of test results for compliance, completeness, and legibility

7. Review of turnover document packages

8. Direction of startup personnel assigned by QA

14.2.2.2.6 Principal Startup Engineer - Construction Completion

The Principal Startup Engineer - Construction Completion is a line function and reports to the startup manager. He has primary responsibility for construction completion functions and for facility turnovers. In this capacity, his responsibilities include:

1. Interface with the Bechtel Construction Group in the areas of:

    a. Construction completion including punchlist and exception list items.

    b. The Release-For-Test (RFT)

2. Coordination and conducting of facility turnover meetings to resolve and disposition all comments at the time of facility turnover.

3. Direction and coordination of all facilities turnover.

14.2.2.2.7 Group Leader(s)

The Group Leader is responsible for the direct supervision of the test engineers and staff assigned to him.

14.2.2.2.8 Senior Supervisor - Technical Crafts

The Senior Supervisor - technical crafts is responsible for overall direction of the technical craft personnel assigned to PSSUG.

14.2.2.2.9 Technical Supervisor

The Technical Supervisor within his discipline is responsible for directing and coordinating the activities of the technicians assigned to PSSUG.

14.2.2.2.10 Test Engineer(s)

The Test Engineer on assigned systems is responsible for development and implementation of test procedures and all other planning, scheduling, design control and other related system activities.

14.2.2.3 Phase III Organization

The Phase III power test program is conducted by the nuclear department - Hope Creek Operations using the organization described in Section 13.1.

The PSSUG, described above, functions as a support group under the direction of the nuclear department during this test phase, in accordance with the operational definitions described in Section 13.

14.2.2.4 Interfacing Organizations

PSSUG interface, described in this section, is illustrated on Figure 14.2-2 and represents, in summary, the principal interfaces essential to the test and startup program through Phases I and II. Phase III interface reflects operational interface and is described in Section 13.1.

14.2.2.4.1 PSE&G Construction Engineer - Site Construction

The Startup Manager interfaces with the PSE&G construction engineer - Hope Creek on all matters relating to:

1. Monitoring of construction quality

2. Monitoring of construction cost and schedule

3. Review of new design change packages (DCP) after turnover

4. Potential impact to construction caused by startup priorities.

14.2.2.4.2 General Manager - Hope Creek Operations

The Startup Manager interfaces with the General Manager - Hope Creek Operations on all matters relating to:

1. The use of Nuclear Department personnel, facilities, and/or procedures in the test and startup program

2. Development of the test and startup program

3. Review of component/system turnover packages

4. Startup spare parts program

5. Phase II preventive maintenance program.

14.2.2.4.3 Manager - QA

The Startup Manager interfaces with the Manager - QA on all matters relating to:

1. NRC inspections and interviews

2. Audit or test and startup activities

3. Review or component/system turnover packages

4. Requests for special QA services

5. Review of administrative procedure revisions and technical procedures.

14.2.2.4.4 Bechtel Project Startup Supervisor

The Bechtel Project Startup Supervisor, based in the San Francisco home office, performs a staff function to the Startup Manager. In this capacity, he acts as an intermediary for the startup manager with Bechtel management to identify PSSUG requirements and expedite resolution. He administratively reports to the division chief startup engineer, Bechtel Power Corporation. His responsibilities include:

1. Allocation of Bechtel startup personnel assigned to PSSUG

2. Resolution of design problems that impact PSSUG

3. Interfacing with the Bechtel project manager, as required by the startup manager, to ensure smooth coordination of the Phase II program

4. Special assignments as required by the startup manager.

14.2.2.4.5 Bechtel Field Construction Manager

The Startup Manager interfaces with the Bechtel field construction manager on all matters not resolved at a lower level, relating to:

1. Construction support for the Phase II testing program

2. PSSUG support for the Phase I testing program

3. Component/system turnover.

14.2.2.4.6 Managers - Research and Testing Laboratory

The Startup Manager interfaces with the discipline PSE&G managers of the Research and Testing Laboratory on matters related to specialized laboratory support to the test and startup program.

14.2.2.4.7 Substation Supervisor - Camden Relay Division

The Startup Manager interfaces with the PSE&G substation supervisor of the Camden relay division on all matters relating to power distribution relay protection and protective circuit calibration.

14.2.2.5 Consultants and Contractors

Services of consultants or contractors may be employed to provide support relative to the test program. Such services are under direct control of the Startup Manager.

14.2.2.6 Preoperational Test Review Committee

The Preoperational Test Review Committee (PORC) is the primary review and approval authority for all preoperational test procedures by PSSUG prior to initial fuel load. The PORC is composed of representatives from the following groups:

1. Engineering (PSE&G)

   a. Mechanical (designated chairman)

   b. Controls

   c. Electrical

2. Nuclear department (PSE&G)

   a. Operation

   b. Technical

   c. Maintenance

3. Public Service Startup Group (PSSUG)

   a. Startup Manager (Vice Chairman)

   b. Alternate Vice Chairman to be a party appointed by the Startup Manager

4. General Electric Operations Manager

A quorum shall consist of the Chairman and one member from the Nuclear department, HCGS Operations and one member from PSSUG. When the PORC is chaired by the Vice-Chairman, an engineering representative or alternate shall be required to constitute a quorum. No more than two alternates shall participate as a voting member in PORC activities at any one time.

Should any of the PORC members be unable to attend meetings, a designated alternate may attend with full capacity to act for that member. The Chairman and the permanent members of the PORC may determine the need for participation by other personnel with specific expertise, as required. The functions and responsibilities of the PORC are:

1. Review and approval of all Q and F preoperational test procedures and any additional special procedures requested by the startup manager. The review assures that test procedures are written in such a manner that systems and components can be properly tested to verify performance requirements of design criteria.

2. Review and approval of all Phase II preoperational test procedure results of those tests outlined in item 1.

3. Review and approval of all proposed changes to procedures outlined in item 1. that change the intent of the procedure. Post-change review and approval of on the spot changes is also required.

14.2.2.7 Station Operational Review Committee

The Station Operational Review Committee (SORC) is the primary review and approval organization during the Phase III test program and is described in Section 13.4.

14.2.2.8 Personnel Qualifications

The minimum qualifications of personnel involved in the Phase I and II test programs are described in this section. The qualifications of personnel involved in the Phase III test program are in accordance with Regulatory Guide 1,8 and ANSI/ANS 3.1-1981.

14.2.2.8.1 Preoperational Test Review Committee (PORC)

The minimum qualifications for PORC members at the time of assignment to the committee are:

1. Graduate of a four year engineering or science college or university, plus five years of experience in testing, operations, or design (or combination thereof) of power plants, nuclear facilities, or similar industrial installations. At least two years of this experience shall be associated with nuclear facilities.

<u>or</u>

2. High school graduate, plus ten years of experience in testing or operation (or both) of power plants or nuclear

facilities. A minimum of two years of this experience shall be associated with nuclear facilities.

14.2.2.8.2 Test Personnel

The minimum qualifications of personnel responsible for performing preoperational test procedures, and generating preoperational test reports are as follows:

1. Graduate of a four year engineering or science college or university.

   <u>or</u>

2. High School graduate and three years experience in testing or operation (or both) of power plants, nuclear facilities or similar industrial installations. The individual shall have training sufficient to acquaint him with the safety aspects of nuclear facilities.

3. Either 1 or 2 plus one year of nuclear power plant experience.

Certification of startup and test department personnel is supported by records and certification status. Every two years a review is accomplished to ensure the continued proficiency of every engineer.

14.2.2.9 <u>Participation of Plant Staff in Phase I and II Test Programs</u>

The plant staff, whose departments are described in Section 13, participate in all areas of the Phase II program.

Operating shift supervisors are responsible for the safe operation of plant equipment and systems through all three phases of testing. All system operations are performed by operations personnel. The

testing shift supervisor and operating personnel are assigned to PSSUG to perform this function during Phases I and II.

The technical department develops instrument, control, and calibration procedures. During Phases I and II, plant technical personnel are assigned to PSSUG to perform these procedures in support of the testing schedule.

The maintenance Department develops the component, assembly, and circuit test procedures. During Phases I and II, plant maintenance personnel are also assigned to the PSSUG to perform these procedures in support of the testing schedule.

Additional plant staff engineers are assigned to PSSUG to perform various activities relating to system testing, as described in Sections 14.2.2.2.2 and 14.2.2.2.7 through 14.2.2.2.12.

The PSSUG maintains overall responsibility for the corrective and preventive maintenance program during the Phase II test and startup program. The nuclear department shall be responsible for the implementation of the corrective maintenance program, augmented by contractors if required.

14.2.3 Test Procedures

All testing shall be performed in accordance with approved test and startup procedures. The six types of technical procedures used during the test and startup program are as follows:

1. General test procedures

2. General test instruction

3. Detail test procedures

4. Corporate test procedures

5. Preoperational test procedures

6. Startup procedures.

14.2.3.1 General Test Procedures

General test procedures (GTPs) provide general test instruction, criteria, and objectives for those tests that have the same general testing requirements from system to system and component to component. This type of technical procedure is used for such testing functions as flushing and cleaning of piping, calibration of field devices, instrument loop calibrations, field pressure leak testing, and heat trace testing.

General test procedures will be reviewed and approved by the Engineering Department, QA, and the Startup Manager. The format of the general test procedures will contain the following minimal sections:

1. Purpose - A short description of the purpose of the procedure

2. Reference - A list of drawings, specifications, manuals, codes, etc, pertinent to the performance of the test

3. General - The main body of the procedure provides, as a minimum, the prerequisites, acceptance criteria, and guidelines for performance of tests, including restoration of system to normal, as appropriate.

14.2.3.2 General Test Instruction (Based on GTPs)

GTIs shall be based upon and reference GTPs and are used to provide additional detailed instructions for implementation. Testing functions described by GTIs are summarized in the Procedure Index and typically include the following:

1. Instrument calibration procedures provided by the Hope Creek Operations Department; and

2. Routine tests required by approved vendor manuals.

14.2.3.3 Detail Test Procedures (DTP)

DTPs are one of a kind procedures which stand alone and are not based on GTPs. These procedures are used to document completion of unique testing functions; such as, design change retest verification on systems that have undergone preoperational testing.

14.2.3.4 Corporate Test Procedures CTP)

Corporate Test Procedures (Manuals) which exist in the PSE&G Corporation - Research and Testing Laboratory and the Camden Relay Division, respectively have received appropriate Engineering review. These procedures (manuals) shall be utilized in the startup program in performance of specific testing. Utilization of these test procedures does not require additional approval per this procedure.

14.2.3.5 Preoperational Test Procedures

Preoperational test procedures verify that systems are designed and constructed to meet design criteria and commitments, and are developed for all Q and F-listed systems and selected balance of plant systems. The format for preoperational test procedures includes:

1. Title/approval record page

2. Table of contents

3. Main body sections

1.0 Test Objectives
2.0 References

3.0 Prerequisites
4.0 Initial Conditions
5.0 Acceptance Criteria
6.0 Special Equipment
7.0 Special Precautions
8.0 Detailed Procedures (including restoration steps as applicable)
9.0 Procedure Completion and Comments.

As a minimum, these procedures are reviewed and approved by PORC, as described in Section 14.2.2.6.

14.2.3.6 Startup Test Procedures

Startup test procedures verify that systems will operate in accordance with design criteria and commitments. The format for startup test procedures is described in administrative procedure SA-AP.ZZ-036(Q).

14.2.4 Conduct of Test and Startup Program

The Hope Creek Generating Station (HCGS) test and startup program is conducted using approved written procedures. The administrative controls governing the conduct of the phase I and II programs are established in the Startup Administrative Manual. The Phase III program is governed by the Station Administrative Procedures outlined in Section 13.5.1. The Startup Administrative Manual, Station Administrative Procedures, and all test procedures are controlled documents.

14.2.4.1 Test Procedure Modifications

Test procedures that require revision undergo the same review/approval process as the original issue.

14.2.4.2 Preoperational Test Phase Prerequisites - Phase II

When a system's construction and construction verification testing are completed, it is formally turned over to PSE&G along with its required turnover documentation.

A formal review for acceptance is performed by PSE&G: The PSE&G reviewers include: the Manager - QA General Manager - Hope Creek Operations and the Startup Manager. Final acceptance is approved by the project manager - Hope Creek, which allows commencement of the Phase II preoperational test program.

Since the BWR preoperational test program does not perform a hot functional test prior to fuel load, snubber thermal movements are monitored during the performance of startup test "System Expansion," described in Section 14.2.12.3.15.

14.2.4.3 Test Performance

The test engineer is responsible for planning and conducting the test in accordance with approved written procedures. Once a test procedure has been approved and issued for use, the test engineer is responsible for ensuring that all prerequisites are satisfactorily completed and all allowable exceptions noted. The test will be scheduled and published.

When the test procedure is approved for performance, and when prerequisites to the test are completed as required, the test can be started. Required personnel are assembled by the test engineer and the test procedure is reviewed in detail and then performed. Operations department support necessary to conduct the tests are coordinated through the testing shift supervisor. During the test, all precautions are observed, and data sheets are completed, reviewed, signed, and dated by the test engineer. Mandatory witness points, as called for in the procedure, are also signed off appropriately. Temporary changes to the systems, as required for testing, are documented and, following completion of the tests,

systems are restored to a predetermined status. The test engineer is responsible for documenting test exceptions, and for testing or retesting these when it becomes possible to do so.

During the performance of all tests, the testing shift supervisor is responsible for the safety and proper operation of the plant. He has the authority to take whatever action he deems necessary to ensure the safe operation of HCGS.

14.2.4.4 Deficiency Reporting and Correction

In the process of construction and preoperational testing, deficiencies may be encountered. Control, documented identification, and resolution of all deficiencies is in accordance with established administrative procedures. This program will include control of corrective maintenance, design modifications and resulting retests.

This program applies to all design, construction, and test/startup deficiencies that exist at the time of component/system turnover (C/ST), or that arise during the Phase II preoperational test program. It includes all deficiencies for non-Q, Q, and F-listed items or systems and is implemented on a system basis at the time of C/ST.

14.2.4.5 Startup Test Phase Prerequisites - Phase III

Following the completion of the Phase II preoperational test program, fuel loading and Phase III testing commence. The station operational review committee (SORC) reviews the requirements for fuel load and the test results following each testing plateau prior to authorization of the next testing plateau. Testing plateaus consist of, but are not limited to, the following:

1. Fuel loading and open vessel testing

2. Initial heatup testing

3. Power testing - included are the test conditions as defined in Figure 14.2-4

14.2.5 Review, Evaluation, and Approval of Test Results

14.2.5.1 Phase I and II Test Results

Upon test completion, the responsible test engineer reviews the test data for completeness and evaluates the results to ensure that they meet all acceptance criteria. Any exceptions are noted. The evaluated test results are submitted to the Startup Manager, or his designee, who reviews the results for completeness, technical accuracy, and conformance to procedures prior to releasing them for results review external to the Public Service Startup Group (PSSUG).

The test results are submitted for review and approval to all those who originally reviewed and approved the procedure with the exception of Bechtel Engineering. Bechtel will be on the procedure approval cycle only.

Should the results to the Phase II test program reveal system, component, design, construction, or manufacturing deficiencies, the startup manager or his designee will take steps to ensure that the deficiencies are reported, investigated, and corrected, as described in Section 14.2.4.4. Any retesting required to further define the nature of the deficiency or to prove satisfactory deficiency correction is accomplished, as directed, by the disposition of the deficiency report.

14.2.5.2 Phase III Test Results

Following the completion of a startup test, the test results are analyzed to ensure that the test acceptance criteria is met. If an acceptance criteria is not met it will be processed in accordance with Section 14.2.12.2.

The test procedure is then processed for completeness and technical accuracy and submitted to the Stations Operations Review Committee (SORC). SORC will review the test results and its conclusions and recommendations forwarded to the General Manager, Hope Creek Operations for review and approval for escalation to the next test plateau.

14.2.6 Test Records

A single copy of each test procedure is designated as the master copy for testing. The master copy of the procedure and all information called for by the procedure, such as completed data forms, instrument calibration data, chart recordings, photographs, etc, is included with the procedure. This information is retained in the Hope Creek Generating Station (HCGS) plant records for the life of the facility.

14.2.7 Conformance of Test Program with Regulatory Guides

All project Regulatory Guide positions are contained in Section 1.8, Conformance to Regulatory Guides. Differences to the SRP Section 14.2.II, Acceptance Criteria are contained in Section 14.2.13.

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

Industry experience documents, including NRC transmittals, Institute of Nuclear Operations (INPO) correspondence and General Electric's Service Information Letters (SIL) are reviewed by the Hope Creek Response Coordination Team (RCT) for applicability to and impact on HCGS. The RCT is composed of representatives from the Nuclear Assurance and Regulation Department, Engineering, Quality Assurance - Engineering and Construction, and Hope Creek Operations with the chairman reporting to the chief project engineer. Applicable industry experience documents which require public service startup group (PSSUG) attention are directed to PSSUG via Hope Creek

Operations RCT representative for review and incorporation into test programs as appropriate.

14.2.9 Trial Use of Plant Operating and Emergency Procedures

The development of plant operating and emergency instructions in the plant manual is described in Section 13. During the preoperational and initial startup test program, the plant manual is used, where applicable. Test procedures may reference the appropriate procedure directly or extract a series of steps from the procedure. The use of procedures during the testing phases serves the following functions:

1. Verification of the accuracy of the procedure and identification of any changes to correct or improve the procedure.

2. Training of plant personnel in the use of the procedures.

3. Familiarization of plant personnel with the systems being tested.

14.2.10 Initial Fuel Loading, Criticality, and Power Range Testing

Initial fuel loading, criticality, and power range testing are accomplished in accordance with approved procedures. Prior to the approval to load fuel, the plant is verified as ready for fuel load. This verification includes the following:

1. Satisfactory completion of the preoperational tests, including disposition of design changes and exceptions.

2. Satisfactory completion of cold functional testing, which provides operating experience with procedures and equipment and allows each shift to function on an integrated basis.

3. Satisfactory completion of the Integrated ECCS Initiation/Loss of Power test (Section 14.2.12.1.47). The test is scheduled such that each shift participates in at least one phase of the test.

4. A review and surveillance check of plant systems to assure compliance with Technical Specifications.

Following the issuance of the operating license and station approval for fuel load to commence, detailed procedures are followed to load the core and perform the Phase III test program. Abstracts from these procedures, which establish objectives, prerequisites, test methods, and acceptance criteria for the Phase III test program, are presented in Section 14.2.12.3.

During Phase III startup testing, hot functional tests as related to BWROG response to NUREG-0737 Item I.G.1, will be performed to assure that, insofar as possible, systems and procedures are ready for operation at various power levels. The hot functional tests are not intended to replace or supplement the startup test procedures discussed in Section 14.2.12.3, but are provided where it is felt additional data over and above the cold functional tests is beneficial. The operations manager will ensure that procedures are upgraded, where required, and that personnel on each shift have been familiarized with the changes to procedures.

The Phase III startup tests will be balanced, to the extent practical, so that each shift may observe several transients, including a scram, and water level, pressure regulator, and turbine trip transients for training.

14.2.11 Test Program Schedule

Figure 14.2-3 represents the tentative test program schedule for Hope Creek Generating Station (HCGS). The schedule depicts the time required to perform construction verification, preoperational, and initial startup testing.

Preoperational test procedures will be made available at least 60 days prior to scheduled performance of the tests. Startup test procedures will be made available at least 60 days prior to scheduled fuel load.

14.2.12 Individual Test Descriptions

14.2.12.1 Preoperational Test Procedures

Following are general descriptions of the specific objectives of the preoperational tests for systems described in NRC Regulatory Guide 1.68, Rev. 2, and/or described in other sections of the FSAR.

The preoperational test acceptance criteria are developed and approved by design organizations. The acceptance criteria stated are developed from reference material such as:

1. FSAR Chapter 16, Technical Specifications

2. FSAR Chapter 15, Accident Analysis

3. Other FSAR sections which provide functional criteria of systems or equipment under Test and Inspection Requirements

4. Vendor technical instruction manuals

5. System electrical schematics, including Bechtel electrical schematics, General Electric elementary diagrams, or vendor supplied electrical schematics. These references are used to define criteria for logic, controls, and interlocks.

6. System piping drawings, including Bechtel P&IDs and vendor supplied piping drawings

7. General Electric Preoperational Test Specification, document number 22A2271AZ.

The specific acceptance criteria will be listed in each preoperational test procedure and will be approved by the design organization. As a prerequisite to the specific system preoperational test procedure, PTP, the proper operation of each alarm and instrument is verified. During the course of the preoperational test, as the system parameters are varied or interlock establish a configuration which will energize an alarm, require data from associated instrumentation, actuates a computer point; the associated alarm, computer point, or data will be re-verified as part of the preoperational test.

14.2.12.1.1 AB-Main Steam System

1. Objectives

   a. To verify proper operation of the pressure safety/relief valves in the manual and Automatic Depressurization System (ADS) modes

   b. To verify that the main steam safety/relief valves (SRVs) installed conform to design specifications

   c. To verify operation of all controls, interlocks, alarms, and valves associated with the main steam system, including main steam isolation valves (MSIVs).

   d. To verify the SRVs associated with ADS and assigned to the remote shutdown system can be operated from the remote shutdown panel.

   e. Instrumentation, alarms, and annunciators shall function in accordance with the G.E. Preoperational Test Specification.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. AC and dc power are available.

   c. Instrument air and primary containment instrument gas are available.

3. Test Method

   a. SRV nameplate setpoints and capacities are checked against system design specifications.

   b. Relief valve discharge line vacuum breakers are checked for freedom of operation.

   c. Check that each SRV air actuator can be actuated when the corresponding control room manual switch is positioned to open/close.

   d. Valves, sensors, and logics are tested for proper operation in the ADS and manual modes.

   e. Check the controls, interlocks, alarms, and operating times of MSIVs and main steam line drains

   f. Check that three ADS relief valves can be operated from the Remote Shutdown panel and transfer switches override controls in the main control room.

   g. Check the operation of the acoustic monitoring subsystem by use of simulated signals.

4. Acceptance Criteria

   a. SRV nameplate data shall meet the requirements in Table 5.2-3 for capacity and pressure setpoint.

   b. Relief valve discharge line vacuum breakers do not stick or bind.

   c. System interlocks and controls, including control of redundant equipment, shall function in accordance with the GE preoperational test specification.

   d. ADS pilot valves shall be demonstrated that they can be operated in accordance with the GE preoperational test specification.

   e. MSIVs and main steam line drain valves which are containment isolation valves close within the time specified in Table 6.2-16.

   f. Remote shutdown panel transfer switches override main control room controls and the three designated ADS relief valves can be operated from the remote shutdown panel.

   g. Acceptance criteria verification for the acoustic monitoring subsystem will be accomplished during power ascension testing as described in Section 14.2.12.3.24.d.3.

14.2.12.1.2 AE-Feedwater

1. Objectives

   a. To demonstrate the operation of the reactor feedwater pumps and feedwater pump turbine.

b. To verify operation of the feedwater system and components.

c. To verify operation of the feedwater control system.

d. Instrumentation, alarms and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. Condensate system is available.

c. Auxiliary Steam System is available.

d. Main condenser is capable of receiving water.

e. Service Water System is capable of meeting cooling requirements.

f. AC and dc power are available.

3. Test Method

a. Each feedwater pump and turbine is operated separately, recirculating water back to the main condenser.

b. System controls and alarms are actuated, including operation of the feedwater pump minimum flow valves and the feedwater Turbine Lube Oil System.

c. Feedwater control system inputs are verified.

d. Reactor water level, feedwater flow, and steam flow step changes are simulated and the output response of the low flow regulatory valve and the speed control loops of the feedwater pumps are checked.

e. Feedwater system remote-operated valve operation is checked.

f. Feedwater flow runback associated with ATWS is checked.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with system electrical schematics.

b. The operation of the reactor feed pumps and turbines is as specified by the vendor technical instruction manual.

c. The operation of the reactor feed pump recirculation valves is as specified by the vendor technical instruction manual.

d. The operation of the reactor feed pump turbine (RFPT) lube oil systems is as specified by the vendor technical instruction manual.

e. Containment isolation valves close within the time specified in Table 6.2-16.

f. The response of the feedwater control system to simulated inputs is specified by the GE preoperational test specification.

g. Feedwater flow runback (ATWS) is within the time specified by the GE preoperational test specification.

14.2.12.1.3 BB-Nuclear Boiler

1. Objective

a. The test objective is to verify proper response, indication, and alarm functions of all nuclear boiler process instruments that are unique to the reactor vessel.

b. Instrumentation, alarms, and annunciators shall function in accordance with the G.E. Preoperational Test Specification.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. AC and dc power are available.

c. Primary containment instrument air is available.

d. Reactor vessel is capable of receiving water.

3. Test Method

a. The reactor vessel water level is varied to verify operation of the level instrumentation.

b. Temperature and pressure monitoring devices are checked during concurrent preoperational testing.

c. ATWS sensor response times are checked.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the GE preoperational test specification.

b. ATWS sensor response times are within the times specified by the GE preoperational test specification.

14.2.12.1.4 BB-Reactor Recirculation

1. Objective

a. The test objective is to demonstrate the functional capability of the recirculation system, such that all controls, motors, motor-generator sets, pumps, and valves work together properly to deliver recirculation flow.

b. Instrumentation, alarms, and annunciators shall function in accordance with the G.E. Preoperational Test Specification.

2. Prerequisites

a. Component tests have been completed and approved.

b. Instrument calibration and loop checks have been completed.

c. AC and dc power are available.

d. Reactor vessel has been flushed clean and filled with demineralized water.

e. Lubrication and cooling for pumps and motors is provided.

3. Test Methods

a. Operate all recirculation loop valves, check interlocks, and verify control and indication capability.

b. Operate the recirculation pumps at reduced flow within the cavitation limits and perform the following:

(1) Verify the logic, controls, interlocks, and loop instrumentation

(2) Verify pump performance and flow parameters

c. Check the operation of the reactor recirculation flow control subsystem, including operation of the M-G set

d. Check RPT breaker trip (ATWS) with reactor high pressure and low level

e. Check the operation of the reactor recirculation pump suction valve from the remote shutdown panel

f. Acceptance Criteria

a. Pump and flow parameters shall be as specified in the GE preoperational test specification.

b. System interlocks and controls, including control of redundant equipment, shall function in accordance with the GE preoperational test specification.

c. Reactor recirculation flow control functions as specified by the GE preoperational test specification

d. The delay time between ATWS sensor actuation and RPT breaker trip is within the time specified by the GE preoperational test specification.

e. Containment isolation valves operate within the time specified by Table 6.2-16.

f. Reactor recirculation pump suction valve can be operated from the remote shutdown panel and the transfer switches prohibit control from the main control room.

14.2.12.1.5 BC-Residual Heat Removal

1. Objective

a. The test objective is to verify the capability of the residual heat removal system to start up and deliver adequate flow of coolant under all modes of operation.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component tests have been completed and approved.

b. Instrument calibration and loop checks have been completed and approved.

c. AC and dc power are available.

d. Reactor vessel is capable of receiving water.

e. Suppression pool water of sufficient purity is available to inject into the reactor vessel.

3. Test Method

a. Valve, sensor, and logic tests are performed to verify the proper operation of the auto-initiation logic, valve, and pressure interlocks and alarm annunciators.

b. The following modes of RHR operation are verified

(1) Test/suppression pool cooling mode, including checks for NPSH, and pump performance operation in accordance with vendor head flow curves.

(2) Low pressure coolant injection mode, including checks for NPSH, pump performance operation in accordance with vendor head-flow curves, and system design flow rate to vessel requirements.

(3) Shutdown cooling mode, including checks for NPSH, and system design flow rate requirements.

(4) Containment spray cooling mode, which will demonstrate that the containment spray headers are clear of obstructions. To verify the wetwell spray mode, water is pumped from the torus through the wetwell spray nozzles and water flow through each nozzle is verified. To verify the drywell spray mode, water is pumped through the air test connection during the RHR flush procedure performance, then air is injected into the drywell spray header via the air test connection and unrestricted flow is verified by the use of streamers at the nozzles.

(5) Fuel pool cooling intertie mode, including checks for NPSH and system design flow requirements

(6) Flow paths for RHR to radwaste and RHR sampling is checked.

c. The RHR jockey pumps are checked by filling and pressurizing the system.

d. LPCI mode is checked for reaction time from simulated initiation to rated flow

e. Operation of RHR suppression pool cooling and shutdown cooling is checked from the remote shutdown panel.

4. Acceptance Criteria

a. Valve operating times are as specified in GE preoperational test specification and Table 6.2-16. Valve indication is as specified in the system electrical schematics.

b. Initiation logic, automatic isolations, and valve and pressure interlocks shall function in accordance with system electrical schematics.

c. Pump head/flow, NPSH, and system design flow requirements are as specified by the GE preoperational design specification.

d. The RHR jockey pump fills and pressurizes the system.

e. LPCI mode injection time is within the time specified by the GE preoperational test specification.

f. Suppression pool cooling mode and shutdown cooling mode can be performed from the remote shutdown panel and transfer switches override control from the main control room.

14.2.12.1.6 BD-Reactor Core Isolation Cooling

1. Objectives

   a. To demonstrate the operation of the Reactor Core Isolation Cooling (RCIC) System during manual and automatic modes of operation.

   b. To demonstrate RCIC turbine operation, flow parameters, pump available net positive suction head (NPSH), speed/flow controls, and auxiliary equipment.

   c. Alarms shall function in accordance with the G.E. Preoperational Test Specifications.

2. Prerequisites

   a. All component tests have been completed and approved.

   b. AC and dc power are available.

   c. All instrumentation has been calibrated and instrument loop checks completed.

   d. Demineralized water is available in the condensate storage tank and the suppression pool.

   e. A source of steam is available for RCIC turbine operation.

   f. The reactor vessel is capable of receiving water.

3. Test Method

a. The system is operated both manually and automatically to verify RCIC pump parameters and flow paths, including NPSH requirements, turbine head/spray curves, and pump head/flow curves. System design flow requirements are also checked.

b. Valve, sensor, and logic tests are performed to verify their proper functioning, including automatic initiation, isolation, valve interlock, turbine trip, turbine test mode operation, gland condenser condensate pump actuation, and alarm annunciation.

c. RCIC startup and operation from the remote shutdown panel is checked.

d. RCIC standby lineup is checked with the jockey pump in operation.

e. The startup of RCIC after loss of ac power is checked.

f. RCIC operation with a sustained loss of ac power is checked for at least two hours

g. DC loads powered by 250 V dc Division B are checked to be independent of any other ESF divisional battery.

4. Acceptance Criteria

a. Valves, controls, interlocks, and logic shall function in accordance with the GE preoperational test specification.

b. Turbine and pump performance shall meet the requirements of the GE preoperational test specification including NPSH, pump head/flow, and system design flow requirements.

c. The system responds to manual and automatic initiation signals and to automatic isolation signals as specified by the GE preoperational test specifications.

d. RCIC can be started and operated from the remote shutdown panel and transfer switches override controls in the main control room.

e. Containment isolation valve closure times are as specified in Table 6.2-16.

f. Available NPSH to the RCIC pump is at least that required by the GE preoperational test specification.

g. RCIC can start up after a loss of ac power and can sustain operation for at least two hours.

14.2.12.1.7 BE-Reactor Core Spray

1. Objectives

a. To verify operation of the Core Spray System, including spray pumps, spray nozzles, control valves, etc, during both recirculation and simulated accident conditions

b. To verify operation of all controls, interlocks, alarms, and valves associated with the core spray system.

c. Alarms shall function in accordance with the G.E. Preoperational Test Specifications for Core Spray.

2. Prerequisites

a. All component tests have been completed and approved.

b. AC and dc power are available.

c. All instrumentation has been calibrated and instrument loop checks completed.

d. Reactor vessel is capable of receiving water.

3. Test Method

a. Valve, sensor, and logic tests are performed to verify the proper operation of the auto initiation logic, valve interlocks, sensors and alarm annunciators.

b. All modes of operation and flow paths are verified, including core spray test mode and core spray injection mode.

c. Pump NPSH, head/flow, and system design flow and head are checked.

d. Core Spray System jockey pump operation is checked.

4. Acceptance Criteria

a. Valves, controls, interlocks, and logic shall function in accordance with the GE preoperational test specifications for core spray.

b. For the core spray test mode and core spray injection mode, the pump head/flow requirements, the NPSH requirements, and the system design flow requirements meet the GE preoperational test specification acceptance criteria.

c. All modes of operation and flow paths shall be as specified in the GE preoperational test specifications.

d. The jockey pump can fill and pressurize the core spray system

14.2.12.1.8 BF-Control Rod Drive - Hydraulic

1. Objective

a. The test objective is to demonstrate that the Control Rod Drive (CRD) System is fully operational, and that all components, including the hydraulic drive mechanism, manual control system, rod position indicator system, and all safety and control devices, function per design.

b. Alarms shall function in accordance with the G.E. Preoperational Test Specifications.

2. Prerequisites

a. All component tests have been completed and approved.

b. AC and dc power are available.

c. All instrumentation has been calibrated and instrument loop checks completed.

d. CRDs, thermal sleeves, control rod guide tubes, the core support plate, fuel support castings, blade guides, and control rods have been properly installed.

e. The reactor vessel has been filled to above the top of the guide tubes with demineralized water.

3. Test Method

a. CRD pumps and motors are operated.

b. Proper functioning of each individual CRD is demonstrated, both continuously and notch by notch. Latching and position indication is verified at each notch.

c. Valve, sensor, and logic tests are performed to verify the proper functioning of alarms and interlocks.

d. The capability of the stabilizer valves to maintain the proper insert and withdraw flow rates is verified.

e. Withdraw and insert speeds for each rod are verified and adjusted if necessary. Scram testing for each individual CRD, and for all CRDs simultaneously, is performed at atmospheric pressure to verify that scram time is within technical specifications.

f. Proper functioning of the flow controller and pressure differentials for charging accumulators, drive water header, and cooling water header are verified at atmospheric reactor vessel pressure.

g. Control rod buffer times are checked once during each individual control rod scram.

h. Scram discharge volume and instrument volume are checked for size and setpoint levels.

i. CRD alternate rod insert (ATWS) is checked during full scram.

4. Acceptance Criteria

a. Valves, controls, interlocks, and logic shall function in accordance with the GE preoperational test specification.

b. Flow and pressure for normal flow paths and operational transients shall be within the limits of the GE preoperational test specification.

c. CRD pumps and motors shall operate as specified by the vendor technical instruction manual.

d. CRD speeds, scram times, and buffer times shall be within the requirements of the GE preoperational test specification.

e. The volume of the scram discharge volume and instrument volume is as specified by the GE preoperational test specification.

f. Alternate rod insert occurs within the time specified by the GE preoperational test specification.

14.2.12.1.9 BG-Reactor Water Cleanup

1. Objective

a. The test objective is to verify that the Reactor Water Cleanup (RWCU) System can maintain the required flow of water of the proper quality and functions, in accordance with its design requirements.

b. Instrumentation, alarms, and annunciators shall function in accordance with the G.E. Preoperational Test Specifications.

2. Prerequisites

a. Component tests have been completed and approved.

b. Instrument calibration and instrument loop checks have been completed.

c. AC and dc power are available.

d. Reactor auxiliaries cooling (RACS) water is available.

e. Reactor water is available to supply pump suction.

f. Reactor vessel, main condenser, and radwaste are capable of receiving water.

3. Test Method

a. All flow paths are verified.

b. The capability to backwash and precoat the filter/demineralizer is demonstrated.

c. Operation of all valve and pump interlocks is checked by simulated signals to appropriate instrumentation.

d. Calibration and alarm of instrumentation trip setpoints and proper operation of the annunciators is verified.

e. Isolation valve closing times are checked.

f. System filter/demineralizer operation, including effluent quality, is checked.

g. ATWS isolation of RWCU is checked.

4. Acceptance Criteria

a. The filter/demineralizer effluent shall be as specified in the GE preoperational test specification.

b. Flow and pressure drop through each filter/demineralizer is as specified in the GE preoperational test specification.

c. Valve and pump interlocks function as specified in the GE preoperational test specification.

d. System interlocks and controls, including control of redundant equipment, shall function in accordance with the GE preoperational test specification.

e. Isolation valve closure times are as specified by Table 6.2-16.

f. ATWS isolation of RWCU functions as specified by the GE preoperational test specification.

14.2.12.1.10 BH-Standby Liquid Control

1. Objective

a. The test objective is to verify that the Standby Liquid Control (SLC) System is capable of delivering the design quantity of neutron absorber to the reactor vessel within the specified limits of temperature, pressure, and flow. (Verification of mixing will be performed prior to fuel load in accordance with standard operating procedure.)

b. Instrumentation, alarms, and annunciators shall function in accordance with the G.E. Preoperational Test Specifications.

2. Prerequisites

a. All component tests have been completed and approved.

b. All instrument calibration and instrument loop checks have been completed.

c. AC and dc power are available.

d. A source of demineralized water is available.

e. Reactor vessel is capable of receiving water.

f. Heat tracing circuits are functionally checked.

g. Air spargers are checked to ensure that they are free of debris.

3. Test Method

a. Proper operation of logic, tank level instrumentation, heaters, relief valves, and pumps is verified.

b. The test tank is filled with demineralized water, and the standby liquid control pumps are operated in the test mode to verify rated flow at rated head and absence of cavitation at low tank level.

c. Each loop is manually initiated using the keylock switch to fire the explosive valve and start the injection pumps. Flow into the reactor vessel is verified.

d. ATWS initiation of standby liquid control is checked.

e. Relief valve lifts are demonstrated.

f. Automatic and manual heater operation is checked.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the GE preoperational test specification.

b. The relief valves shall operate as specified by the GE preoperational test specification.

c. Pump flow and pressure shall be as specified in the GE preoperational test specification.

d. Heaters shall maintain the temperature of the solution in the tank as specified in the GE preoperational test specification.

e. Pumps shall not cavitate at low storage or test tank levels.

f. ATWS initiation of standby liquid control and response times is as specified in the GE preoperational test specification.

14.2.12.1.11 BJ-High Pressure Coolant Injection

1. Objectives

a. To demonstrate the functional integrity of the HPCI system during manual and automatic modes of operation

b. To demonstrate HPCI turbine operation, flow parameters, pump available NPSH, speed/flow controls, and auxiliary equipment.

c. Alarms shall function in accordance with the G.E. Preoperational Test Specification.

2. Prerequisites

a. All component tests have been completed and approved.

b. AC and dc power are available.

c. All instrumentation has been calibrated and instrument loop checks completed.

d. Demineralized water is available in the condensate storage tank and the suppression pool.

e. Auxiliary steam is available for HPCI turbine operation.

f. The reactor vessel is capable of receiving water.

c. Test Method

a. The system is operated both manually and automatically. Turbine speed/head characteristics, pump head/flow characteristics, pump NSPH requirements, and system flow requirements are checked.

b. Valve, sensor, and logic tests are performed to verify their proper functioning, including automatic initiation, isolation, valve interlock, turbine trip, turbine test mode operation, and gland condenser condensate pump actuation.

c. Suppression pool level is varied, demonstrating the operability of level instrumentation.

d. The system standby lineup is checked with the jockey pump in operation.

e. The startup of HPCI following loss of ac power is checked.

f. HPCI operation during a sustained loss of ac power is demonstrated for at least two hours.

g. It is checked that the dc loads of HPCI are provided by 250 V dc Division A battery system and are totally independent of other ESF divisional batteries.

4. Acceptance Criteria

a. Valves, controls, interlocks, and logic shall function in accordance with the GE preoperational test specification.

b. Pump head/flow, turbine head/speed, pump NPSH, and system initiation time and system flow are as specified by the GE preoperational test specification.

c. The system shall respond to manual and automatic initiation signals and to automatic isolation signals as specified by the GE preoperational test specification.

d. Suppression pool level instruments shall function as specified in the GE preoperational test specification.

e. HPCI will start up after loss of ac power.

f. HPCI can operate for a sustained period following loss of ac power for at least two hours.

g. HPCI dc loads are independent of any other dc battery system.

h. The jockey pump can fill and pressurize the HPCI system for standby operation.

14.2.12.1.12 EA-Station Service Water

1. Objective

a. The test objective is to verify the capability of the service water system to deliver cooling water to nonsafety and safety-related components serviced by this system.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component tests have been completed and approved.

b. All instrumentation is properly calibrated and operable.

c. AC and dc power are available.

d. The appropriate sections of the following systems are available for testing:

(1) RACS

(2) Safety Auxiliary Cooling System (SACS)

(3) Residual Heat Removal (RHR) System.

(4) Turbine Auxiliary Cooling System (TACS)

3. Test Method

a. Normal flow paths are tested to verify that design flow rates are available during all modes of operation.

b. Normal system functions, including automatic strainer backflushing and auto-start features, are verified.

c. Pump and system parameters are verified to be within design specifications.

d. Valve, sensor, interlock and logic tests are performed to verify their proper functioning.

e. Operation of SSWS loop B pumps from the remote shutdown panel is checked.

4. Acceptance Criteria

   a. Valves and system interlocks and controls, including control of redundant equipment, shall function in accordance with system electrical schematics.

   b. Pump and system head and flow parameters shall be as specified in Section 9.2.

   c. SSWS can be operated from the remote shutdown panel and transfer switches override the controls in the main control room.

14.2.12.1.13 EC-Fuel Pool Cooling and Cleanup

1. Objective

   a. The test objective is to demonstrate the capability of the Fuel Pool Cooling and Cleanup (FPCC) System to provide water flow to system components and maintain the required water level in the spent fuel pool.

   b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component tests have been completed and approved.

   b. All instrument calibrations and instrument loop checks have been completed.

   c. AC and dc power are available.

   d. The spent fuel storage pool and upper containment pools are filled with demineralized water.

e. Leak test of the spent fuel pool, cask storage pool, dryer and separator pool, seals, and gates have been performed by construction.

3. Test Method

a. All controls, interlocks, and remote operated valves are checked to ensure performance in accordance with design specifications.

b. Normal system flow paths are verified.

c. The fuel pool filter/demineralizers backwash, precoat, and filtering abilities are checked.

d. Vacuum breakers in the return lines to the fuel pool are checked.

e. Operation of designated components from the remote shutdown panel are checked.

4. Acceptance Criteria

a. Valves, controls, and interlocks shall operate in accordance with the system electrical schematics.

b. System flow paths, pump flows and head, and heat exchanger flow are as specified in Section 9.1.3.

c. Fuel pool filter/demineralizer effluent is as specified by Section 9.1.3.

d. Vacuum breakers prevent the siphoning of water from the fuel pool.

e. Fuel pool components specified in Table 7.4-2 can be operated from the remote shutdown panel and transfer switches override control from the main control room.

14.2.12.1.14 ED-Reactor Auxiliaries Cooling

1. Objectives

   a. The test objective is to verify the capability of the RACS to provide cooling water to its components.

   b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component tests have been completed and approved.

   b. All instrumentation is properly calibrated and operable.

   c. The appropriate sections of systems associated with the RACS are operable.

   d. AC and dc power are available.

3. Test Method

   a. Normal flow paths, and pump head and flow are checked.

   b. All trips, permissives, interlocks, and controls are checked for proper operation.

4. Acceptance Criteria

   a. Valves and system interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

   b. The pump and system parameters shall be as specified in Section 9.2.1.

14.2.12.1.15 EE-Torus Water Cleanup

1. Objective

   a. The test objective is to demonstrate the operability of the Torus Water Cleanup System to meet design specifications.

   b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All component tests have been completed and approved.

   b. All instrumentation is calibrated.

   c. AC and dc power are available.

   d. Suppression pool is at normal operating level.

3. Test Method

   a. The Torus Water Cleanup System is operated to verify system and pump parameters.

   b. All controls are checked for proper operation.

c. Containment isolation valves are checked for closure times.

4. Acceptance Criteria

a. The pump and the system performance shall be as specified in Section 9.1.3.

b. System interlocks and controls, including control of redundant equipment, shall function in accordance with system electrical schematics.

c. Containment isolation valve closure time is as specified in Table 6.2-16.

14.2.12.1.16 EG-Safety and Turbine Auxiliaries Cooling Systems

1. Objectives

a. To verify the capability of the Safety and Turbine Auxiliaries System (STACS) to provide cooling water to its components

b. To verify the various modes of operation.

c. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component tests have been completed and approved.

b. All instrumentation is properly calibrated and operable.

c. AC and dc power are available.

d. The appropriate sections of systems associated with the STACSs are operable.

3. Test Method

a. All flow paths for all modes of operation are verified.

b. Pump and system parameters are verified to be within design specifications.

c. Valve, sensor, and logic tests are performed to verify the proper operation of valve interlocks, sensors, auto-start, and auto-isolation logic.

d. Remote shutdown panel operation of SACS is checked.

4. Acceptance Criteria

a. Controls, interlocks, and logic shall function in accordance with system electrical schematics.

b. Pump and system parameters shall be as specified in Section 9.2.2.

c. All modes of operation and flow paths shall be in accordance with the system piping diagrams.

d. SACS pumps and controls specified in Table 7.4-2 can be operated from the remote shutdown panel and transfer switches override controls from the main control room.

14.2.12.1.17 GH-Auxiliary Building (Radwaste Area) HVAC Preoperational Test

1. Objective

a. The test objective is to demonstrate the capability of the radwaste area ventilation system to supply and maintain air flows and temperatures within design limits.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment relays and instrumentation have been functionally operated and calibrated.

b. All wiring continuity checks and megger tests have been completed.

c. All motor alignments and run-ins have been completed.

d. The appropriate ac and dc power sources are available.

e. The ventilation chilled water system is in service.

f. Preliminary Air Balance is sufficiently complete to support testing.

g. The plant heating system is available.

3. Test Method

a. All fan, heater, damper, and cooling interlocks, trips, permissives, and controls are checked to ensure performance within design specifications.

b. Airflow patterns are verified to ensure flow from relatively clean areas to areas with a potential for

higher radioactivity with a pressure differential between clean areas and highest radioactive areas.

c. The pressure in the radwaste area with respect to outside ambient during system operation is checked.

4. Acceptance Criteria

a. Fan and damper controls, interlocks, and permissives, shall function as specified by system electrical schematics.

b. Airflow patterns shall be from clean areas to progressively more contaminated areas.

c. The heating and cooling systems shall function as specified in the vendor technical instruction manual.

d. Radwaste pressure with respect to outside ambient is negative with the system in operation.

e. Fan operating capacity is as specified by Table 9.4-10.

f. Balancing of air flows and exhaust filtration and adsorption unit testing has been completed. The filtration and adsorption unit testing has met the recommendations of NRC Regulatory Guide 1.140, using ANSI N510-1980, including:

(1) Visual inspection.

(2) Air flow distribution test.

(3) DOP test for HEPA filters.

(4) Carbon adsorber leak test with halogenated hydrocarbon refrigerant.

14.2.12.1.18 GJ-Control Area Chilled Water

1. Objective

   a. The test objective is to demonstrate the capability of the chilled water system to supply and maintain the appropriate water temperatures within design specifications.

   b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. All wiring continuity checks and megger tests have been completed.

   c. All motor alignments and run-ins have been completed.

   d. Makeup water and the SAC system are available.

   e. All control valves associated with this system have been operated and meet design specifications.

   f. The appropriate ac and dc power sources are available.

3. Test Method

   a. Each chiller unit and chilled water circulating pump is verified to perform in accordance with design criteria.

   b. System controls, trips, interlocks, and permissives are verified for proper operation.

   c. Control valves are verified to operate in accordance with system design logic.

   d. Chilled water flow to components cooled by this system are checked.

4. Acceptance Criteria

   a. System interlocks and controls, including control of redundant equipment, shall function in accordance with system electrical schematics.

   b. The Chilled Water System and component performance is as specified in Section 9.2.7.2.

14.2.12.1.19 GK-Control and Wing Area HVAC

1. Objective

   The test objective is to demonstrate the capability of the main control and wing area air conditioning systems to provide proper airflows, heating, and cooling capabilities for the various modes of operation, including simulated post loss of coolant accident (LOCA) conditions.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. All wiring continuity checks and megger tests have been completed.

c. All motor alignments and run-ins have been completed.

d. The appropriate ac and dc power sources are available.

e. The main control room chilled water system is available.

f. Preliminary Air Balance is sufficiently complete to support testing.

3. Test Method

a. All fan, heater, damper, and air conditioner interlocks, trips, permissives, and controls are verified for proper operation.

b. System flow paths are verified.

c. Operating times for isolation dampers are verified for proper operation.

d. Recirculation operation is verified.

e. Correct system response to manual and automatic isolation signals is verified.

f. The main control room is verified to be at a positive pressure with respect to surrounding areas during normal operation.

g. Main control room makeup air is verified to be within design limits while operating in the recirculation mode.

h. The heating and cooling systems are verified for proper operation upon receipt of high and low temperature signals.

4. Acceptance Criteria

a. Fans, heaters, dampers, and air conditioning controls shall function in accordance with system electrical schematics.

b. System flow rates and paths shall be in accordance with Section 9.4.1.

c. Operating times for isolation dampers shall be as specified by the vendor technical instruction manual.

d. System recirculation mode shall operate in accordance with Section 9.4.1.

e. The main control room shall be maintained at a positive pressure, with respect to surrounding areas, as specified in Section 6.4.

f. Main control room air shall be maintained within the limits specified in Section 6.4.

g. Balancing of airflows and exhaust filtration and adsorption unit testing has been completed. The filtration and adsorption unit test shall have met

the recommendations of NRC Regulatory Guide 1.140, using ANSI N510-1980, including:

(1) Visual inspection

(2) Air flow distribution test

(3) DOP test for HEPA filters

(4) Carbon adsorber leak test with halogenated hydrocarbon refrigerant.

14.2.12.1.20 GL-Service Area HVAC

1. Objective

   a. The test objective is to demonstrate the capability of the service area Heating, Ventilation, and Air Conditioning (HVAC) Systems.

   b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. All wiring continuity checks and megger tests have been completed.

   c. All motor alignments and run-ins have been completed.

   d. The chilled water system is available.

e. Preliminary Air Balance is sufficiently complete to support testing.

f. The appropriate ac and dc power sources are available.

g. The heating steam system is available.

3. Test Method

a. Fans, dampers, heaters, and cooling interlocks, trips, permissives, and controls are verified for proper operation.

b. The airflow patterns are verified to ensure flow from relatively clean areas to areas with a potential for higher radioactivity with a pressure differential between clean areas and higher radioactive areas.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with system electrical schematics.

b. Airflow patterns shall be from clean areas to progressively greater contaminated areas.

c. System balancing and filter efficiency tests have been completed.

14.2.12.1.21 GM-Diesel Generator Area HVAC System

1. Objective

The test objective is to verify the system's automatic functions and the ability of the supply and exhaust fans

to maintain the diesel generator rooms within design temperature limits during standby and diesel generator operation.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. All wiring continuity checks and megger tests have been completed.

   c. All motor alignments and run-ins have been completed.

   d. The appropriate ac and dc power sources are available.

   e. The SACS is in service.

   f. Preliminary Air Balance is sufficiently complete to support testing.

3. Test Method

   a. The system's automatic functions are verified for heating and cooling operations. The automatic dampers are verified for operation according to system design.

   b. Diesel generator room fans are checked to verify automatic start in response to their associated diesel generator starting.

   c. The heating and cooling systems are verified to operate upon receipt of high and low temperature signals.

4. Acceptance Criteria

a. Heaters, cooling coils, damper interlocks, trips, and permissives shall function as specified in the system electrical schematics.

b. The diesel generator room fans shall start automatically in response to their associated diesel generator starting.

c. The diesel generator room coolers and heaters shall be capable of maintaining each diesel generator room within design temperature limits during standby and operating conditions as specified in Sections 9.4.6 and 3.11.

d. Final Air Balance has been completed.

14.2.12.1.22 GP-Primary Containment Leakage Rate Testing and Drywell Bypass Leakage Test

1. Objective

The test objective is to verify that the primary containment total leakage rate does not exceed design specifications.

2. Prerequisites

a. Construction within primary containment has been completed.

b. Primary containment penetration construction is complete through the first isolation valve.

c. Reactor vessel and suppression pool are filled with water to the normal operating level.

d. Required test equipment has been installed, calibrated, and functionally demonstrated.

e. Systems required to support testing are operational.

f. Individual leak tests B and C of 10CFR50, Appendix J, have been completed.

3. Test Method

a. The primary containment is pressurized with air, and the leak rate is measured in accordance with 10CFR50, Appendix J. The test methods are described in Section 6.2.

b. While performing the primary containment leak rate test, check that all instrumentation that monitors drywell pressure tracks the drywell pressure while the drywell pressure is being increased and decreased.

4. Acceptance Criteria

a. The primary containment total leakage rate shall be within the limits specified in 10CFR50, Appendix J.

b. Drywell pressure transmitters to recorders, meters, trip units, alarms, and computer points track the drywell pressure.

14.2.12.1.23 GS-Primary Containment Atmosphere Control

1. Objective

a. The test objective is to demonstrate that the system maintains the primary containment atmosphere as

necessary to protect the continuity and structural integrity of the primary containment.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. All wiring continuity checks and megger tests have been completed.

c. All motor alignments and run-ins have been completed.

d. The appropriate ac and dc power sources are available.

e. All system hydros and flushes have been completed.

f. The heating steam system is available.

3. Test Method

a. System controls, fans, dampers, interlocks, trips, and permissives are checked for proper operation.

b. The nitrogen vaporization system is verified to perform according to design specifications.

c. The vacuum relief system is verified to perform according to design specifications.

d. The hydrogen recombiner system is verified to perform according to design specifications.

e. The hydrogen/oxygen analyzing system is checked.

f. Containment isolation valve operability is checked.

4. Acceptance Criteria

a. All controls, logic, and interlocks function as specified by the system electrical schematics.

b. The Hydrogen Recombiner System operation is per Section 6.5.2.4 and as specified below:

(1) Upon startup, each recombiner will increase the temperature of the process gas to it's design value.

(2) Each recombiner can be heated up to operating temperature within the design specified time.

(3) The recombiner effluent is cooled to its design temperature.

c. The Nitrogen Vaporizer System operation is per Section 6.2.5.2.1 and as follows:

(1) Supplies nitrogen at a rate at least equal to the minimum design flow during makeup.

(2) Supplies nitorgen at a rate at least equal to the minimum design flow during inerting.

(3) Supplies nitrogen at design temperatures.

d. The Combustible Gas Analyzer operation is per Section 6.2.5.2.5 and as specified below:

(1) The Combustible Gas Analyzer can sample for H_2 and O_2 from the required locations.

(2) Combustible Gas Analyzer Sample lines isolation valves operate per system design logic.

(3) The Combustible Gas Analyzer can accurately sample H_2 and O_2.

(4) The analyzer sample stream identifier will indicate the sample stream selected when only one stream is selected. When more than one stream is selected, the stream identifier will not indicate.

(5) The sample lines are heat traced and maintain required sample gas temperature.

e. Containment isolation valves closure times are specified in FSAR Table 6.2-16.

f. The Suppression Chamber to the Reactor Building and Drywell to Suppression Chamber vacuum relief valves (VRV) function per Section 6.2.5.2.3 and the Design Installation and Test Specification D3.40 and as specified below.

(1) The Reactor Building to Suppression Chamber VRV isolation valves will fully open within the design specified time when the accumulator tanks are at design specified value while isolated from their compressed air supply.

(2) The Reactor Building to Suppression Chamber and Drywell to Suppression Chamber VRV will start to open at the required design pressure.

14.2.12.1.24 GT-Drywell Ventilation

1. Objectives

   a. To verify the proper operation and response of the drywell cooling units by simulating various modes of system operation

   b. To verify the proper operation and response of the containment prepurge cleanup system by simulating various modes of system operation.

   c. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All permanently installed equipment, relays, alarms, and instrumentation have been functionally operated and calibrated.

   b. All wiring continuity checks and megger tests have been completed.

   c. All motor alignment and run-ins have been completed.

   d. The appropriate ac and dc power sources are available.

   e. The ventilation chilled water system is available and balanced.

   f. The RACS is available.

   g. Preliminary Air Balance is sufficiently complete to support testing.

h. The FPS is available for the charcoal filter units.

i. The primary containment can be isolated.

3. Test Method

a. Each unit is checked for response to manual signals from the main control room.

b. Alarms are verified in the main control room in the event of fan failure or low water flow.

c. It is demonstrated that each unit responds properly to simulated signals for emergency plant conditions.

d. It is demonstrated that the alternate cooling system to the drywell units can be activated from the main control room.

e. It is demonstrated that all fans, dampers, isolation valves, trips, permissives, interlocks, and controls associated with the containment pre-purge system function correctly.

f. It is demonstrated that trips, interlocks, alarms, and controls associated with the containment pre-purge filter trains function correctly.

4. Acceptance Criteria

a. Fan and demand per controls, interlocks, and permissives, shall function in accordance with system electrical schematics.

b. The unit coolers shall operate from signals initiated by manual controls from the main control room.

c. The response of the unit coolers to simulated accident conditions shall be in accordance with Section 9.4.5.

d. The air distribution shall continuously supply cooling air at locations and flow rates specified in Section 9.4.5.

e. The ability to transfer cooling systems from chilled water to the RACS occurs as specified in Section 9.4.5.

f. Containment prepurge fans, dampers, valves, trips, interlocks, and controls function as specified in system electrical schematics and Section 9.4.2.

g. Balancing of airflows and filter efficiency tests are completed.

14.2.12.1.25 GU-Filtration, Recirculation, and Ventilation System

1. Objectives

a. To verify upon Reactor Building isolation that the Filtration, Recirculation, and Ventilation System (FRVS) recirculates the Reactor Building air through filters for cleanup.

b. To demonstrate the capability of the cooling coils in the recirculation units to limit temperatures during reactor building isolation.

c. To demonstrate the capability of the moisture separator and heating coils to reduce the relative humidity to acceptable levels prior to entering the charcoal filters.

d. To verify the ability of the air handling equipment to maintain the Reactor Building at a slightly negative pressure with respect to outside atmospheric pressure.

e. To verify that the filter trains meet design specifications.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. All wiring continuity checks and megger tests have been completed.

c. All motor alignments and run-ins have been completed.

d. The appropriate ac and dc power sources are available.

e. The SACS is available

f. Preliminary Air Balance is sufficiently complete to support testing.

g. The primary containment and reactor building can be isolated.

3. Test Method

a. All fans, dampers, isolation valve trips, permissives, interlocks, and controls are checked for proper operation.

b. All trips, interlocks, and controls associated with the exhaust filter train are checked for proper operation.

c. Airflow patterns are verified to ensure flow from relatively clean areas to areas with a potential for higher radioactive contamination; also, that the air handling equipment can maintain the Reactor Building at a slightly negative pressure with respect to outside atmospheric pressure.

d. Demonstrate the operation of the cooling coils in the recirculation units to limit temperatures during reactor building isolation.

e. Demonstrate the operation of the moisture separator and heating coils in each unit to reduce the relative humidity to acceptable levels prior to entering the charcoal filters.

4. Acceptance Criteria

a. Fans, dampers, isolation valves, permissives, interlocks, and controls shall function in accordance with system electrical schematics.

b. Filter train trips, permissives, interlocks, and controls shall function in accordance with the system electrical schematics.

c. System dampers and valves shall isolate within the operating times specified in Section 9.4.2.

d. The Reactor Building shall be maintained at a slightly negative pressure with respect to outside atmospheric pressure, as specified in Section 6.8.

e. Systems, unit heaters, coolers, and moisture separation equipment is demonstrated to operate in accordance with the manufacturer's technical instruction manual.

f. Balancing of airflows, and exhaust filtration and adsorption unit testing has been completed. The filtration and adsorption unit test shall have met the recommendations of NRC Regulatory Guide 1.140, using ANSI N510-1980, including:

(1) Visual inspection

(2) Air flow distribution test

(3) DOP test for HEPA filters

(4) Carbon adsorber leak test with halogenated hydrocarbon refrigerant.

14.2.12.1.26 JE-Diesel Fuel Oil Transfer and Storage

1. Objective

a. The test objective is to verify the diesel fuel oil storage and transfer system flow paths.

b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Required instrumentation has been calibrated and functionally operated.

b. AC and dc power are available.

c. The diesel fuel oil storage tank has been filled to its normal operating level.

3. Test Method

a. Diesel transfer pumps are operated by pumping fuel oil from the storage tanks to the day tanks.

b. Normal flow paths are verified.

c. All control, interlocks, and valves are checked for proper operation.

4. Acceptance Criteria

a. Valves, shall function in accordance with the system electrical schematics.

b. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

c. The pump parameters are as specified in Table 9.5-4.

14.2.12.1.27 KB-Instrument Air

1. Objectives

a. To verify proper functioning of the instrument air systems, including air compressors and their related motors and controls, aftercoolers, air receivers, and air drying equipment

b. To verify proper functioning of affected safety-related components during loss of instrument air.

c. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component tests have been completed and approved.

b. Instrument calibration and loop checks have been completed.

c. AC and dc power are available.

d. SACS and RACS cooling water is available.

e. Pressure relief valve setpoints have been verified for proper operation.

3. Test Method

a. Air compressors, filters, and dryers are operated.

b. The capacity and quality of air supplied to the instrument air systems is verified to be within design specifications.

c. Valve sensor and logic tests are performed to verify controls, and interlocks, for proper operation.

d. The affected safety-related components are verified for proper operation during loss of instrument air.

e. A test to verify that service air is not cross connected to instrument air is conducted.

4. Acceptance Criteria

a. Valves shall function in accordance with the system electrical schematics.

b. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

c. Air compressors, filters, and dryers shall operate as specified by in Section 9.3.1.4.

d. The quality of air supplied to the instrument air systems shall meet the requirements of Section 9.3.1.4 and ANSI MC 11.1-1975 as defined in Section 1.8.1.68.3.

e. Safety-related air operated components fail to the safe position on loss of instrument air.

f. Service air does not cross connect with instrument air downstream of the air dryers.

g. The compressor capacity shall meet the design requirement of a minimum of 500 SCFM at system design operating pressure of 100 psig.

14.2.12.1.28 KC-Fire Protection - CO_2

1. Objective

a. The test objective is to demonstrate the proper operation of the CO_2 FPS. The test will specifically demonstrate the proper operation of the CO_2 automatic flooding systems.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component tests, including those on the refrigeration and storage units, have been completed and approved.

b. System instrumentation have been calibrated and approved.

c. AC and dc power are available.

3. Test method

a. All valves, controls, interlocks, and logic are checked for proper operation.

b. The refrigeration system is verified to perform according to design specifications.

c. It is demonstrated that the system responds properly to simulated fire signal to verify proper system interlocks and response times.

d. System is actuated to verify that CO_2 is automatically injected into the area.

4. Acceptance criteria

a. Valves, controls, interlocks and logic operate in accordance with the system electrical schematics.

b. The system responds to simulated fire signals.

c. The refrigeration system operates to maintain pressure and temperature as specified by the manufacturer's technical instruction manual.

d. CO_2 concentrations are in accordance with NFPA12 and design specifications.

14.2.12.1.29 KC-Fire Protection - Water

1. Objective

a. The test objective is to verify the capability of the fire protection system to deliver water to the sprinkler system, pre-action and deluge systems, hose stations, and hydrants at rated pressure and flow.

b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component tests have been completed and approved.

b. System instrumentation has been calibrated and approved.

c. AC and dc power are available.

d. The diesel fire pump local fuel oil storage tank is in service.

e. Adequate fire protection water supply is available.

f. A walkdown has been performed to identify components or areas that may be susceptible to damage due to actuation of the deluge system.

g. Floor drains have been provided to remove the expected fire fighting water flow from automatic sprinkler systems, hand hose lines, etc. Temporary build up of water in the affected spaces will not flood safe shutdown equipment.

3. Test Method

a. Valves, controls, interlocks, and logic are checked for proper operation.

b. Normal system flow paths are verified.

c. Operation of diesel and electric fire pumps is verified.

d. Operation of the sprinkler system is verified.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

b. The system shall provide adequate water at rated pressure and flow to meet the requirements in Section 9.5.1.

c. The diesel and electric fire pumps shall operate in accordance with Section 9.5.1.

d. Sprinkler systems are operable per Section 9.5.1.

14.2.12.1.30 KJ-Emergency Diesel Generators

1. Objectives

   a. To demonstrate standby diesel engine starting reliability, sustained load carrying capability, and independence from offsite power sources.

   b. To verify that the system is capable of providing emergency electrical power during normal, and simulated, accident conditions, and that voltage and frequency are maintained within specified limits during steady-state and transient loading conditions.

   c. Automatic starting, connection to the respective Class 1E buses, and load sequencing in response to simulated emergency conditions will be tested in the ECCS integrated initiation during loss of offsite power test described in Section 14.2.12.1.47.

   d. To demonstrate the operability of diesel generator auxiliary systems, including the diesel fuel oil transfer and diesel generator starting air supply systems.

   e. To demonstrate the capability of the diesel generator system to:

      (1) Synchronize with an offsite power source while loaded

      (2) Undergo periodic surveillance testing

      (3) Respond properly to signals requiring emergency power while undergoing surveillance testing

(4) Resume standby status from an operational mode.

f. Instrumentation, and alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. All wiring continuity checks and megger tests have been completed.

c. Service and control air is available.

d. All appropriate ac and dc power sources are available.

e. Diesel generator room HVAC is operational.

f. Sufficient diesel fuel is onsite to perform the test.

g. All cooling systems relevant to this test are in service.

h. FPSs, or adequate temporary fire protection measures, for the diesel generator rooms and fuel oil storage tank rooms are in service.

3. Test Method

a. Each diesel generator is checked for starting and trip sequences to ensure proper operation.

b. All auxiliary systems are checked to verify operation within design specifications.

c. All interlocks, controls, and alarms are verified to operate in accordance with design specifications.

d. Demonstrate that manual and automatic operation of the diesel generators is satisfactory, and that they start automatically upon simulated loss of ac voltage and attain the required frequency and voltage.

e. Verify that proper response and operation of the design basis accident loading sequence to design basis load requirements, and verify that voltage and frequency are maintained within specified limits. The 24-hour full load test, load shedding, and test for capability to withstand the loss of the largest single load will be demonstrated in the preoperational test described in Section 14.2.12.1.47, ECCS integrated initiation during loss of offsite power.

f. Demonstrate full load carrying capability of the diesel generators for a period of not less than 24 hours, of which 22 hours are not less than the equivalent DBA full load for the respective bus, and 2 hours are at the 2-hour 110 percent load rating. Following the 24 hour run, an automatic restart due to simulated loss of ac power, and auto-sequence loading to design-load requirements will immediately be performed as part of the ECCS integrated initiation during loss of offsite power test described in Section 14.2.12.1.47.

g. Verify that the diesel generators can be synchronized to an offsite power source while maintaining the Class 1E loads.

h. Verify that the Standby Diesel Generator (SDG) System is capable of transferring the Class 1E load from the

generator to the offsite power source, and of isolating the generator from the bus and returning it to standby status.

i. Verify that the rate of fuel consumption at design basis load for each diesel generator is such that the requirements for 7-day storage inventory are met as part of the 24-hour full load test.

j. During surveillance testing, verify the capability of the diesel generators to respond to an emergency signal and supply power to the Class 1E bus, while monitoring time, frequency, and voltage.

k. Verify that load rejection does not result in exceeding specified speeds, maximum voltage and frequency.

l. Check all instrumentation, alarms, annunciators, system interlocks, and controls, including control of redundant equipment for proper operation.

m. Demonstrate starting reliability by means of any consecutive valid starting tests without failure.

n. Demonstrate that the diesel generator can be started with the air receiver charging compressors isolated at least the number of times specified in the FSAR.

4. Acceptance Criteria

a. System configuration is as shown in the manufacturer's technical instruction manual.

b. All auxiliary systems operate as specified in Sections 9.5.5, 9.5.6, 9.5.7, and 9.5.8.

c. Interlocks, controls, alarms, and control of redundant equipment is as specified in the Bechtel design specification.

d. Diesel generator can be started manually and automatically. In the manual mode the diesel can be operated from both the control and the local station.

e. On an automatic start, the diesel will attain rated speed and voltage as specified in Section 8.3.1.1.3.

The diesel generator shall operate for 24 hours under load as specified in Section 8.3.1.1.3. The automatic restart and loading after the 24 hour run shows that the diesel generator attains rated speed and voltage as specified in Section 8.3.1.1.3.

f. In response to DBA simulation the loading sequence is as specified in Table 8.3-1 and voltage and frequency are maintained within the values specified in Section 8.3.1.1.3. This will be demonstrated in the ECCS integrated initiation during loss of offsite power test described in Section 14.2.12.1.47.

g. The diesel generator will synchronize to offsite power while maintaining the Class 1E loads, transfer the load to offsite power, and resume standby status following an operational mode.

h. The diesel generator fuel oil storage tanks have a demonstrated capacity as specified in Section 9.5.4.2.1, based upon engine fuel consumption.

i. With the diesel generator operating in the surveillance mode, it will respond to an emergency

signal and be prepared to supply power to Class 1E bus loads.

j. Load rejection does not result in exceeding speeds or voltages which cause diesel generator tripping or mechanical damage.

k. The standby diesels start the number of times specified in Section 9.5.6.3 without the air receiver recharging compressor available.

(Historical Information)

14.2.12.1.31 KP-Main Steam Isolation Valve Sealing

1. Objective

   a. The test objective is to verify flow paths, controls operation, interlocks, and alarms associated with the Main Steam Isolation Valve (MSIV) Leakage Control System.

   b. Alarms and interlocks shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All permanently installed equipment and instrumentation has been functionally operated and calibrated.

   b. AC and dc electrical power are available.

   c. Containment instrument gas is available.

   d. Portions of the main steam will supply systems are available.

(Historical Information -cont)

e. Type C leak rate tests on MSIVs are completed.

3. Test Method

   a. Valves, controls, interlocks, switches, and alarms are checked for proper operation.

   b. The system is initiated and checked to assure it will pressurize the main steam lines between the isolation valves.

4. Acceptance Criteria

   a. Valve operating times for containment isolation valves are as specified in Table 6.2-16.

   b. Valves, controls, and interlocks shall function in accordance with the system electrical schematics.

   c. The system will maintain a positive pressure as specified in Section 6.7 above reactor vessel pressure.

14.2.12.1.32 PB-4160 V Class 1E Station Power

1. Objective

   a. The test objective is to demonstrate the functional capability of the 4160 V power distribution system, including plant protective relaying, breaker interlocks, and trip and close logic associated with the 4160 V switchgear and transformers.

   b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Normal 1380 V station service power is available.

b. The applicable FPSs are in service.

c. 125 V dc power distribution system is in service.

d. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

e. All wiring continuity checks, megger tests, and high potential tests have been completed and meet design requirements.

3. Test Method

a. The 4160 V systems are energized from the station service transformers.

b. Proper voltage, frequency, phasing, and power distribution is verified.

c. The loss of a station service transformer is simulated for station service buses, and the proper operation of the automatic transfer system is demonstrated.

d. The restoration of a station service transformer is simulated, and the automatic transfer system is demonstrated.

e. Check all prohibit and permissive interlocks, controls, and transfer devices.

f. Check the load carrying capability of breakers, switchgear and transformers. This test may be demonstrated in the preoperational Emergency Core Cooling System integrated initiation during loss of offsite power test, described in Section 14.2.12.1.47.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with system electrical schematics.

b. Bus voltage, frequency, and power distribution shall be in accordance with the electrical one-line diagrams and NEMA Standard MG-1-1980, Part 12.

c. On loss of a service transformer, automatic transfer to the other service transformers occurs.

d. Switchgear, breakers, and transformers will carry the supplied loads specified in Section 8.3.

14.2.12.1.33 PG/PH 480 V Class 1E Unit Substation and Motor Control Center Power

1. Objective

a. The test objective is to demonstrate the capability of the 480 V ac bus distribution system and the 480 V ac motor control centers (MCCs) to provide power to non-Class 1E and to uninterruptable Class 1E loads.

b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. The appropriate sections of the 4160 V ac distribution systems are operational.

   b. The 125 V dc power distribution system is operational.

   c. Sufficient 480 V ac auxiliaries are available to provide bus loads during the test.

   d. The applicable FPSs are available to all equipment.

   e. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   f. All wiring continuity checks, megger tests, and high potential tests have been completed and meet design requirements.

3. Test Method

   a. The 480 V ac buses are energized by their respective 4160 V ac supplies. Bus voltage, frequency, and phasing are verified to be within design specifications.

   b. Trips, permissives, interlocks, controls, and alarms for the 480 V ac substations are demonstrated.

   c. Trips, controls, and alarms for MCCs and breakers are checked for proper operations.

4. Acceptance Criteria

   a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

   b. Bus voltage, frequency, and power distribution shall be in accordance with the electrical one-line diagrams and NEMA Standard MG-1-1980, Part 12.

14.2.12.1.34 VT - Vessel Internal Test

1. Objective

   The test objective is to demonstrate that flow induced vibrations similar to those expected during operation will not cause damage to the reactor internals.

2. Prerequisites

   a. Reactor recirculation pumps and jet pump instrumentation are operational.

   b. The reactor vessel hydrostatic test has been completed, and all internals required for the flow test have been installed.

3. Test Method

   a. A pre-flow test visual inspection of the vessel internals is performed.

   b. The reactor recirculation system is operated at rated volumetric flow for a minimum of 35 hours with two pumps' balanced flow. A minimum of 14 hours of single loop operation is completed at rated volumetric loop flow for each of the loops.

c. A visual inspection of the vessel internals is performed at completion of the flow test.

4. Acceptance Criteria

Visual inspection shall indicate no significant wear, cracking, defects, or loosening of bolts.

14.2.12.1.35 PJ-250 V dc Class 1E Power

1. Objective

a. The test objective is to demonstrate that the 250 V dc batteries, charger, and power distribution systems are capable of providing power under both normal and abnormal plant conditions.

b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Battery room ventilation system is operational.

b. Sufficient dc loads, either normal or temporary, are available to provide battery load.

c. Initial battery charge has been completed.

d. 480 V ac is available to battery chargers.

e. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

f. All wiring continuity checks and megger tests have been completed and meet design requirements.

3. Test Method

a. The systems are energized and the maximum amount of load applied.

b. The capability of each battery charger to individually maintain a float charge on its associated battery, and to provide an equalizing charge along with maximum bus load is demonstrated.

c. An acceptance and service test is performed on each battery to verify battery capacity and load sizing. However, contrary to 1EEE 450-1975, cells will not be shorted at polarity reversal during the acceptance test, on the basis that any cell reaching 1.2 V prior to the battery reaching 100 percent capacity, would be declared defective and replaced. Acceptance tests are terminated at 9 hours, terminal voltage, or when the first cell, after 8 hours, reaches 1.2 V, thus assuring the system is in its best possible condition prior to operation. Any test terminated for reasons other than terminal voltage (above), with capacity greater than 100 percent, will have its actual discharge capacity (for baseline purposes) interpolated by Engineering, using voltage drop curves, for up to 2 percent variation from terminal voltage. In addition to this completed pre-op test and prior to fuel load, this data will be used to evaluate a performance test conducted in strict accordance with 1EEE-450. The batteries are then recharged to demonstrate battery charger capability. Battery terminal voltage, individual cell voltages, temperatures, and specific gravity are measured during these tests.

d. The battery rooms are checked for hydrogen buildup during battery operation to ensure proper operation of the battery room exhaust systems.

e. Separation of buses and loads of separate electrical divisions is checked.

f. Instrumentation, controls, interlocks, and alarms are checked.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

b. Battery chargers shall provide battery float and equalizing charge while maintaining normal design bus loads.

c. The batteries shall maintain maximum design bus loads upon loss of battery chargers for the time specified in Section 8.3.2. Individual cell voltages and battery terminal voltages meet the requirements of Section 8.3.2.

d. Batteries shall meet their ampere-hour capacities and battery chargers will restore battery charge in the time specified in Section 8.3.2.

e. Hydrogen buildup shall remain at a safe level in the battery room as specified in Section 9.4.1.1.5.

f. There are no interconnections of divisional 250 V dc systems.

14.2.12.1.36 PK-125 V dc Class 1E Power

1. Objective

   a. The test objective is to demonstrate that the 125 V dc batteries, charger, and power distribution systems are capable of providing power under both normal and abnormal plant conditions.

   b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Battery room ventilation system is operational.

   b. Sufficient dc loads, either normal or temporary, are available to provide battery load.

   c. Initial battery charge has been completed.

   d. 480 V ac is available to battery chargers.

   e. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   f. All wiring continuity checks and megger tests have been completed and meet design requirements.

3. Test Methods

   a. The system is energized and the maximum amount of load applied.

b. The capability of each battery charger to individually maintain a float charge on its associated battery, and to provide an equalizing charge along with the maximum bus load, is demonstrated.

c. A test is performed to demonstrate the ability of each battery to accept load by deenergizing the battery charger while the affected bus is carrying normal load.

d. An acceptance and service test is performed on each battery to verify battery capacity and load sizing. However, contrary to IEEE 450-1975, cells will not be shorted at polarity reversal during the acceptance test, on the basis that any cell reaching 1.2 V prior to the battery reaching 100 percent capacity, would be declared defective and replaced. Acceptance tests are terminated at 9 hours, terminal voltage, or when the first cell, after 8 hours, reaches 1.2 V, thus assuring the system is in its best possible condition prior to operation. Any test terminated for reasons other than terminal voltage (above), with capacity greater than 100 percent, will have its actual discharge capacity (for baseline purposes) interpolated by Engineering, using voltage drop curves, for up to 2 percent variation from terminal voltage. In addition to this completed pre-op test and prior to fuel load, this data will be used to evaluate a performance test conducted in strict accordance with 1EEE-450. The batteries are then recharged to demonstrate battery charger capability. Battery terminal voltage, individual cell voltages, temperatures, and specific gravity are measured during this test.

e. The battery rooms are checked for hydrogen buildup during battery operation.

f. Separation of buses and loads of separate electrical divisions is checked.

g. Controls, logic, and interlocks, and alarms are checked.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

b. Battery chargers shall provide battery float and equalizing charge while maintaining normal design bus loads.

c. The batteries shall maintain normal design bus loads upon loss of battery chargers for the time specified in Section 8.3.2. Individual cell voltage and battery terminal voltage meet the requirements of Section 8.3.2.

d. Battery parameters shall meet their ampere-hour capacities, and the battery chargers shall restore battery charge within the time specified in Section 8.3.2.

e. Hydrogen buildup shall remain at a safe level as specified in Section 9.4.1.1.5.

f. There are no interconnections of divisional 125 V dc systems.

14.2.12.1.37 PN-Class 1E 208/120 V AC Power

1. Objective

    a. The test objective is to demonstrate the ability of the 208/120 V ac power distribution system to supply rated voltage and frequency to safety-related components from normal and standby power supply sources.

    b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

    a. The appropriate sections of the 480 V ac power distribution system are operational.

    b. The appropriate sections of the 125 V dc power distribution system are operational.

    c. Sufficient loads are available for system loading.

    d. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

    e. All wiring continuity checks, megger tests, and high potential tests have been completed and meet design requirements.

    f. The static inverters perform in accordance with design specifications.

3. Test Method

a. The 120 V ac Class 1E power distribution panels are energized by their normal power supplies.

b. Loss of the normal power supply is simulated, and automatic load transfer to standby power supplies is demonstrated, for each 208/120 V ac Class 1E power distribution panel.

c. Normal operating conditions are reestablished, and automatic load transfer to normal power supplies is demonstrated.

d. Proper voltage, frequency, and power distribution is verified for normal and standby power supply sources.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

b. Bus voltage, frequency, and power distribution shall be in accordance with the electrical one-line diagrams and NEMA Standard MG-1-1980, Part 12.

c. Automatic transfer between normal and standby power supplies shall occur on loss of normal power supply.

d. Class 1E 120 V ac distribution panels shall be electrically isolated from each other.

14.2.12.1.38 QF-Inplant Communication

1. Objectives

   a. To demonstrate that the public address and evacuation alarm systems are audible above normal noise levels inside the plant and in high noise areas.

   b. To demonstrate communications between the main control room or remote shutdown panel and work stations following transients or accidents, including fires.

   c. To demonstrate that communication links are sufficient throughout the site to support normal operations and routine maintenance.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. All wiring continuity checks and megger tests have been completed and meet design requirements.

   c. The appropriate ac power is available.

3. Test Method

   a. With area equipment running, verify that the public address and evacuation alarm systems are audible, and that the two-way radio system can transmit and receive in all station areas.

b. Communications required for plant shutdown from within or outside the main control room are demonstrated.

c. A test is performed that demonstrates the ability of the communications system to provide for intra-plant and plant to offsite communication to meet requirements of security, operation, and maintenance.

d. Communication between the remote shutdown panel and areas in the plant where manual control of equipment may be necessary is demonstrated.

4. Acceptance Criteria

a. Public address and alarm systems shall be audible above normal noise levels.

b. Communications shall be successfully established in each demonstration, both from the main control room and the remote shutdown panel.

14.2.12.1.39 QK-Fire and Smoke Detection and Alarm

1. Objective

a. The test objective is to demonstrate operation of the fire detection system, including associated alarms.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. AC and dc power are available.

3. Test Method

a. Heat and smoke detectors are tested for proper operation.

b. Controls, alarms, and logic are tested with simulated inputs.

4. Acceptance Criteria

a. Detection devices shall perform in accordance with Section 9.5.1.2.

b. Controls, and logic shall operate in accordance with the system electrical schematics.

14.2.12.1.40 SB-Reactor Protection System

1. Objectives

a. To verify that scram signal initiation of the Reactor Protection System (RPS) is in accordance with design specifications

b. To demonstrate that the RPS motor generator set is capable of supplying power to the RPS under normal and switching conditions

c. To verify that the response times of the RPS conform to design specifications.

d. Alarms and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. AC and dc electrical power are available.

c. Instrument air is available.

3. Test Method

a. Each scram channel subsystem's logic is verified in all combinations of logic.

b. Proper operation of all bypass switches, mode switches, and permissives verified.

c. Proper functioning of all primary sensors, reset delays, and trips is demonstrated.

d. Proper operation and performance of the reactor protection system motor-generator sets is verified.

e. Normal and alternate power supply system operation under normal and transient conditions is verified.

f. Trip system power independence and fail safe features are checked.

g. Response times of all RPS channels are measured, inclusive of sensor and hardware, as specified in the GE preoperational test specification.

4. Acceptance Criteria

a. RPS logic functions, interlocks, and time delay functions shall be as specified by the GE preoperational test specification.

b. Response time shall be as specified in the GE preoperational test specification.

c. RPS motor generator sets shall operate as specified in the GE preoperational test specification.

d. Power supply switching and interlocks shall function as specified in the GE preoperational test specification.

e. The RPS shall respond per design to simulated scram condition input signals as specified in the GE preoperational test specification.

14.2.12.1.41 SD-Area Radiation Monitoring

1. Objective

The test objective is to verify the ability of the area RMS to detect abnormal gamma radiation levels and warn personnel.

2. Prerequisites

All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

3. Test Method

   a. All area radiation monitor channels are checked with calibrated radioactive sources for response, verification.

   b. Proper operation of alarms, recorders, and indicators is verified checked by subjecting the channel to simulated signals.

4. Acceptance Criteria

   a. Monitors shall respond to a standard radioactive point source and meet the response and accuracy requirements specified in Section 12.3.4.1.2.

   b. Recorders, indicators and trip units shall function in accordance with the system electrical schematics.

14.2.12.1.42 SE-Neutron Monitoring System

1. Objectives

   a. The test objective is to demonstrate that the Neutron Monitoring System (NMS) functions according to design specifications; the neutron monitoring system includes the source range monitor (SRM), the intermediate range monitor (IRM), the local power range monitor (LPRM), the average power range monitors (APRM), the rod block monitor (RBM), and the Traversing In-core Probe Subsystem (TIPs).

   b. Instrumentation, alarms, and annunciators shall function in accordance with the G.E. Preoperational Test Specification.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. AC and dc power are available.

c. The Rod Position Information System (RPIS), RPS, and Reactor Manual Control System (RMCS) are operational.

3. Test Methods

a. Proper operation of trips, trip lights, annunciators, and recorders is verified by inputting simulated signals at the preamplifier. This is applicable for all ranges of the monitors.

b. Proper operation of flow recorders, indicators, and trips is verified by injecting simulated signals to the loop recirculation flow transmitters.

c. Proper operation of all TIP monitor placement mechanisms is to be verified by positioning each over their full range.

d. Proper operation of the rod block monitor is verified by injecting simulated signals to the LPRM and APRM on individually selected control rod groups.

4. Acceptance Criteria

a. System interlocks and controls, including control of redundant equipment, shall function in accordance with the GE preoperational test specification.

b. Logic and interlock circuits shall function in accordance with the GE preoperational test specification.

c. The TIP system will operate in all modes as specified in the GE preoperational test specification.

14.2.12.1.43 SF-Reactor Control

1. Objective

a. The test objective is to demonstrate proper operation of the RMCS, RPIS, rod worth minimizer (RWM), and Rod Sequence Control System (RSCS).

b. Alarms shall function in accordance with G. E. Preoperational Test Specifications.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

b. Computer diagnostic tests have been completed and test programs loaded.

3. Test Method

a. All rod blocks, including refueling blocks, alarms, and interlocks for all modes of the reactor mode switch are checked.

b. Rod position information system interface process computer is checked.

c. Rod motion-directional control valve sequence is checked.

d. With simulated low power and the rod sequence control system bypassed, the rod worth minimizer is checked.

e. With the rod worth minimizer bypassed, the rod sequence control system is checked.

4. Acceptance Criteria

a. Rod blocks, and interlocks function as specified in the GE preoperational test specification.

b. Rod position information system functions as specified in the GE preoperational test specification.

c. The control rod directional control valve sequence at the hydraulic control unit functions as specified in the GE preoperational test specification.

d. The rod worth minimizer functions as specified by the GE preoperational test specification.

e. The rod sequence control system functions as specified by the GE preoperational test specification.

14.2.12.1.44 SG-Seismic Monitoring System

1. Objective

The test objective is to verify functional integrity of the system in all modes of operation.

2. Prerequisites

a. AC and dc power are available.

b. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

3. Test Method

a. Verification of the seismic monitoring system capability is demonstrated by the integrated operation of the following:

(1) Triaxial accelerometers

(2) Seismic trigger and logic

(3) Batteries

(4) Signal conditioners and magnetic tape recorders

(5) Alarm circuits and annunciators.

b. The test is conducted by initiating signals that simulate seismic events.

4. Acceptance Criteria

a. The Seismic Monitoring System responds in test, record, and playback modes, to simulated seismic signals.

b. Annunciation is received when the seismic switches and triggers are displaced.

14.2.12.1.45 SM-Nuclear Steam Supply System Shutoff and Primary Containment Isolation

1. Objectives

   a. To verify operation of the Nuclear Steam Supply System Shutoff (NSSSS) isolation valves and primary containment in accordance with design and logic specifications

   b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. All containment isolation valves and other equipment that starts or stops automatically upon receipt of a containment isolation signal must be operable and in their untripped position.

3. Test Method

   a. The isolation valves are checked to ensure that automatic closure times are within design requirements by inserting simulated signals and measuring the closure times.

   b. All logic combinations initiating automatic closure are verified.

   c. Auxiliary actions, including fan starts, and damper action are checked.

4. Acceptance Criteria

   a. Containment isolation valves shall close automatically upon receipt of their isolation signals.

   b. Valve closure times shall be within the requirements of Table 6.2-16.

   c. On removal of actuating signal (ESF) and/or resetting of the isolation or actuation signal, equipment remains in emergency mode.

   d. Interlocks shall function in accordance with the system electrical schematics.

14.2.12.1.46 SP-Process Radiation Monitoring

1. Objective

   a. The test objective is to verify the capability of the process radiation monitoring system to detect radioactivity in the monitored process lines.

   b. Instrumentation, alarms, and annunciator shall function in accordance with design and logic specifications.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. Sections of the monitored systems required for the test are operational.

c. Ac and dc power as available.

3. Test Method

a. The flow and flow path are checked for each process monitor loop.

b. Check sources are used to verify system sensitivity.

c. Local and remote controls, alarms, trips, recorders, and indications are checked.

d. In conjunction with the off-gas system, the main steam system, liquid radwaste system, and the isolation features of the process radiation monitoring system are checked.

4. Acceptance Criteria

a. Check source operation and system sensitivity shall be in accordance with the manufacturer's technical instruction manual.

b. Trips, and associated system isolation function as specified by the system electrical schematics and Section 11.5.

c. Process monitor loop flows shall be in accordance with the manufacturer's technical instruction manual.

d. System interlocks and controls, including control of redundant equipment, shall function in accordance with the system electrical schematics.

e. The main steam line process radiation monitoring subsystem and the off-gas pretreatment process

radiation monitoring system operate as specified by the GE preoperational test specification.

14.2.12.1.47 Emergency Core Cooling System (ECCS) Integrated Initiation During Loss of Offsite Power

1. Objectives

a. To demonstrate the 24-hour full load capacity of the diesels, the capability to withstand the loss of the largest single load, and the capability of load shedding and sequencing to provide alternate power sources to standby buses during a partial or complete loss of offsite power (LOP).

b. To demonstrate the ability of RHR and core spray systems to realign and inject rated flow to the reactor vessel within the prescribed period of time in response to a loss of offsite power coincident with a simulated LOCA signal.

c. To demonstrate the ability of the diesel generators to maintain ECCS loads while ECCS provides rated flow.

d. To verify independence of standby buses and correct assignments of loads by performing the loss of offsite power coincident with the LOCA signal four times, each time allowing only three diesel generators to start, and having only their associated dc system energized.

e. To verify, under the worst case conditions of a simulated LOCA coincident with loss of offsite power and inoperable battery chargers that:

(1) The measured dc system loads and battery voltage levels are consistent with battery sizing criteria

(2) The dc system loads remain operable at the resulting voltage levels.

2. Prerequisites

a. Preoperational testing of systems required for this test is complete

b. All permanently installed instrumentation properly calibrated

c. All test instrumentation calibrated

d. Appropriate ac and dc power sources available

e. Standby electrical switchgear rooms cooling system available

f. Plant Class 1E standby buses loaded with normal plant demands

g. Standby diesel generator system available

h. Diesel generator rooms ventilation systems available

i. Safety Auxiliary Cooling System available

j. RHR system available

k. Core spray system available

l. Reactor vessel available to receive water.

3. Test Method

a. Demonstrate the load carrying capability of the emergency switchgear and transformers.

b. Perform a total loss of offsite power with no LOCA and subsequent starting of the diesel generators associated with the standby buses, shedding of all 4-kV loads on the bus and tripping of incoming feeder breakers to the bus, connecting the diesel generators to the bus after reaching rated voltage at rated frequency, and finally the timed sequential restart of normal loads.

c. Provide a simulated LOCA signal with normal power available and test ECCS integrated response by injecting to the vessel beginning with normal system lineup.

d. Demonstrate the independence and correct load assignments for each standby bus in accordance with Regulatory Guide 1.41.

e. Demonstrate a simulated LOCA signal simultaneously with a loss of offsite power. Verify diesel generators undergo a 24-hour full load run, loss of the largest single load, load shedding and sequencing, and verify integrated ECCS response. Verify voltage at designated motor terminals are not less than 80 percent of normal voltage during motor starts.

The battery chargers for each standby dc bus are to remain disconnected for the duration of the test. The test is continued for a period of 4 hours. Battery voltage and current is measured to check that:

(1) The dc system loads remain within the design load profile values for each respective dc bus.

(2) The dc voltage remains greater than or equal to the minimum design value under conditions of steady state and transient loading.

(3) The dc system loads respond and operate properly throughout the test period.

4. Acceptance Criteria

a. On a loss of coolant accident, diesel generators start and load shed and sequence as specified in Table 8.3-1.

b. On total loss of bus voltage, diesel generators start, shed loads, and accept the sequenced loads as specified in Table 8.3-1.

c. Integrated ECCS response demonstrates the ability of RHR and core spray to inject water into the reactor vessel at the flow rates and within the times specified in the GE Preoperational test specification.

d. Integrated ECCS response in conjunction with simulated LOCA/LOP signals demonstrates the ability of the diesel generators to maintain ECCS load while they provide rated flow to the vessel within the time specified in the GE preoperational test specification.

e. Dc system loads operate at voltage levels which occur during integrated ECCS response to a simulated LOCA event in conjunction with LOP and inoperable battery chargers.

f. On removal of actuating signal (ESF) and/or resetting of the isolation or actuation signal, equipment remains in emergency mode.

14.2.12.1.48 Fuel Handling and Vessel Servicing Equipment

1. Objectives

   a. To verify all interlocks and logic associated with the refueling platform and service platform.

   b. To verify the operation of the refueling platform.

2. Prerequisites

   a. Refueling platforms installed and operable

   b. Reactor vessel available when needed

   c. Ac and dc electrical power available

   d. Service air system available

   e. All electrical circuit continuity and functional tests completed

   f. All instrumentation has been calibrated.

3. Test Method

   a. Check proper operation of the refueling system interlocks associated with the refueling platform and service platform in conjunction with the reactor manual control preoperational test.

   b. Check the load limit setpoints associated with the refueling platform.

c. Check the operation of the refueling and service platform.

4. Acceptance Criteria

a. Load limit settings meet the requirements of the GE preoperational test specification.

b. Refueling interlocks and logic function as specified by the GE preoperational test specification.

14.2.12.1.49 Main Turbine Control

1. Objectives

a. To verify the capability of the electrohydraulic control (EHC) pumping unit to respond to control functions from the pressure regulator

b. To verify operability of the turbine bypass, turbine stop, control, and intercept valves.

c. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All component tests have been completed

b. Ac and dc power available

c. All applicable instrumentation has been calibrated.

3. Test Method

a. Check operability of the EHC pumping unit and verify all interlocks, and operating levels.

b. Check operation of turbine related valves from the EHC control panel and measure stroke times.

c. Initiate pressure regulator signals to the EHC control circuit and verify corresponding sequential operation of the turbine related valves and their interlocks with the Reactor Protection System.

4. Acceptance Criteria

a. Controls, trips, permissives, and interlocks function as specified in the electrical schematics and the vendor technical instruction manual.

b. The EHC pumping unit operates as specified in the vendor technical instruction manual.

c. Turbine hydraulically operated valves operate smoothly on signal demand and close within the times specified in the vendor technical instruction manual.

14.2.12.1.50 Condensate

1. Objectives

a. To demonstrate operation of the condensate, condensate demineralizers, and condenser hotwell level control systems.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All component tests completed.

b. The condensate demineralizer subsystem is available.

c. The Reactor Feedwater System is available

d. The main condenser is available for use.

e. Ac power is available.

f. Turbine Auxiliary Cooling System is available.

g. All applicable instrumentation has been calibrated.

3. Test Method

a. The condensate pumps are performance tested, flow rates, suction heads and discharge heads are checked.

b. Controls, interlocks, and trips, are checked.

c. The operation of the hotwell level control system is checked.

d. Minimum flow rates and valve operation is checked.

e. Condensate demineralizer effluent quality is checked.

4. Acceptance Criteria

a. Controls, interlocks, and trips, function as specified in the electrical schematics

b. Pump performance is as specified in Section 10.4 and available NPSH is at least that specified in the vendor technical instruction manual.

c. The condensate demineralizer effluent quality is at least that specified in Section 10.4.

d. Pump minimum flow rates is at least that specified in the vendor technical instruction manual.

14.2.12.1.51 Emergency Lighting

1. Objectives

To verify that the Essential Lighting System, the Standby Lighting System, and the standby self-contained 8-hour battery pack units provide illumination to the specified areas under degraded conditions.

2. Prerequisites

a. Continuity and functional checks have been completed.

b. Appropriate ac and dc power distribution systems are available and operable.

3. Test Method

a. Check that the Essential Lighting System is operable from diesel generator backed MCCs and provides illumination in rooms where control and maintenance of safety-related equipment is required.

b. Check that the Standby Lighting System provides illumination to specified areas.

c. Check that the self-contained battery pack units are located in the specified areas and can provide illumination for 8 hours before recharging is required.

4. Acceptance Criteria

a. The Essential Lighting System can provide illumination to the areas specified in Section 9.5.3, under LOCA conditions.

b. The Standby Lighting System can provide illumination to the areas specified in Section 9.5.3 while there is a loss of both onsite and offsite power.

c. The self-contained battery pack units can provide illumination to the areas specified in Section 9.5.3 for a minimum of 8 hours as specified in Section 9.5.3.

14.2.12.1.52 Circulating Water

1. Objectives

a. To verify circulating water system capability for providing flow to the main condenser from the cooling tower basin.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component testing is complete.

b. Station service water is available.

c. The cooling tower is available.

d. All applicable instrumentation has been calibrated.

3. Test Method

   a. Controls, interlocks, and instrumentation are checked.

   b. System flow characteristics are checked by operating the circulating water pumps in a recirculating mode, cooling tower to main condenser to cooling tower.

   c. Valve operation and interlocks of valves with the circulating water pumps are checked.

4. Acceptance Criteria

   a. Controls, and interlocks, function as specified in the Bechtel electrical schematics.

   b. Pump flow characteristics meet those specified in Section 10, Table 10.4-3.

   c. The opening and closing rates of the circulating water pump discharge valves minimize system transients.

14.2.12.1.53 DELETED

14.2.12.1.54 Remote Shutdown

1. Objectives

   a. To demonstrate that systems required to shut down the reactor from outside the main control room can be operated from the remote shutdown panel.

b. Individual portions of this test can be performed in conjunction with or as part of system tests such as RCIC and RHR.

2. Prerequisites

a. Component tests are complete, including calibration of instrumentation.

b. Ac and dc electrical power is available.

c. The following systems are required to support the test and are available:

(1) RCIC

(2) RHR

(3) Safety auxiliaries cooling (SACS) - Loop B

(4) Station service water (SSWS) - Loop B

(5) Reactor building ventilation (RBVS)

(6) Control area chilled water (CACWS) - Loop B

(7) Nuclear boiler instrumentation

(8) Portions of fuel pool cooling (FPCS)

(9) Specified ADS designated safety relief valves

(10) Reactor recirculation pump suction valve - Loop B

(11) Suppression pool monitoring

(12) Switchgear room coolers (indication)

(13) Standby diesel generator system (indication).

3. Test Method

a. Check that remote shutdown valves, controls, and pumps, designated to the remote shutdown panel are operable when the appropriate control switch transfers function from main control room.

b. Demonstrate in conjunction with the RCIC preoperational test that the RCIC turbine, valves, controller, alarms, and indication can be operated from the remote shutdown panel.

c. Demonstrate in conjunction with the RHR preoperational test that the RHR system can be operated in the suppression pool cooling mode and the shutdown cooling mode from the remote shutdown panel.

d. Demonstrate in conjunction with the SACS preoperational test that the SACS can supply cooling water to the RHR heat exchanger and room coolers while operating from the remote shutdown panel.

e. Demonstrate in conjunction with the SSWS preoperational test that the SSWS can supply cooling water to the SACS heat exchanger while being operated from the remote shutdown panel.

f. Demonstrate in conjunction with the ADS preoperational test that the designated relief valves can be operated from the remote shutdown panel.

g. Demonstrate in conjunction with the control area chilled water preoperational test that designated

portions of the system can be operated from the remote shutdown panel.

4. Acceptance Criteria

   a. Remote shutdown system valves, and controls, designated in Section 7.4.1.4, and Table 7.4-2 can be operated from the remote shutdown panel.

   b. Transfer of control of equipment to the remote shutdown panel disconnects control from the main control room and causes an alarm in the main control room.

14.2.12.1.55 Process Computer

1. Objectives

   To verify the input/output list of the process computer and its relationship to the scan, log, and alarm program.

2. Prerequisites

   a. All component tests completed.

   b. Ac electrical power available.

   c. Computer diagnostic tests completed.

   d. The scan, log, and alarm (SLA) program has been entered into the process computer.

3. Test Method

   a. Check that each analog and digital input point has the correct printout range, alarm, and engineering units.

   b. Check that each analog and digital sensor input has the correct polarity and signal conditioning.

4. Acceptance Criteria

   a. Each analog and digital input terminates at the correct location as specified by the process computer input/output list.

   b. Each analog and digital point is printed out in ranges, alarms, and units as specified by the process computer input/output list.

14.2.12.1.56 Post Accident Sampling

1. Objectives

   a. To verify the Post Accident Sampling System (PASS) has the capability of providing samples of reactor coolant and containment atmosphere.

   b. To verify the interlocks and logic associated with PASS.

   c. Alarms shall function in accordance with the system electrical schematics and the G. E. Preoperational Test Procedure.

2. Prerequisites

   a. All component tests completed.

b. Electrical power available.

c. Demineralized water available.

d. Safety Auxiliaries Cooling System lined up to the liquid cooler.

e. All applicable instrumentation has been calibrated.

3. Test Method

a. Check all logic, and interlocks.

b. Check the operation of remote operated valves.

c. Check the time required to obtain a sample.

d. Check that the PASS sample panel can obtain a sample from all designated locations.

4. Acceptance Criteria

a. Logic, and interlocks, function as specified in the GE preoperational test specification, and the system electrical schematics.

b. The time required to obtain a gas or liquid sample is no greater than that required by the GE preoperational test specification.

c. PASS can obtain samples from all locations specified in Section 9, Table 9.3-3.

14.2.12.1.57 Process Sampling

1. Objectives

   a. To verify that representative samples throughout the turbine, auxiliary, and reactor buildings related to plant operation and liquid radwaste processing can be obtained.

   b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component tests are complete.

   b. Demineralized water is available.

   c. Instrument air is available.

   d. Cooling water is available to the sample coolers.

   e. All applicable instrumentation has been calibrated.

3. Test Method

   a. Check that all designated sample points can be sampled and that flow paths are correct.

   b. Demonstrate the operation of remote operated valves, cooling heat exchangers, sensors, and indicators.

4. Acceptance Criteria

   a. The sampling systems can draw samples from the locations specified in Section 9.3.2.

b. Containment isolation valve closure times are as specified in Table 6.2-16 for the reactor recirculation and RHR sample valves.

c. Logic, and interlocks, function, as specified in the system electrical schematics.

14.2.12.1.58 Main Condenser Air Removal

1. Objectives

a. To verify that the mechanical vacuum pumps are capable of generating and maintaining a vacuum condition within the main condenser.

b. Within the limitations of the Auxiliary Steam System, to demonstrate the operation of the steam jet air ejectors.

c. To verify the instrumentation, interlocks, logic, alarms, and valves associated with the main condenser evacuation system.

d. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All component tests are completed

b. Electrical power is available

c. Instrument air is available

d. Gland seal system is available

e. Main turbine can be put on turning gear

f. The gaseous radwaste system is available

g. All applicable instrumentation has been calibrated

3. Test Methods

a. Check the functioning of controls, and interlocks.

b. Check the operation of remote operated valves.

c. Operate the mechanical vacuum pumps in order to draw a vacuum on the main condenser.

d. Line up auxiliary steam through the steam jet air ejectors and check the operation of the air ejectors.

4. Acceptance Criteria

a. Controls, and interlocks, function as specified in the system electrical schematics.

b. Remote operated valves function as specified in the system electrical schematics. Operating times are comparable to those given in the vendor technical instruction manual.

c. The mechanical vacuum pump can evacuate the main condenser as specified in Section 10.4.2.2.1.

d. The steam jet air ejectors can maintain condenser vacuum.

14.2.12.1.59 Cranes and Hoists

1. Objectives

   a. To demonstrate the operation of the reactor building polar crane.

   b. To demonstrate the operation of various cranes, hoists, and rigging equipment associated with refueling or preparation of fuel load. Some lifting equipment will be demonstrated in the fuel handling and vessel servicing equipment preoperational test.

2. Prerequisites

   a. Component testing has been completed.

   b. Static load tests have been completed by construction at 125 percent of rated load in accordance with NUREG-0554.

   c. All applicable instrumentation has been calibrated.

3. Test Method

   a. Check controls, interlocks, and travel limits.

   b. Perform a 100 percent operational load test on all cranes and hoists listed in Table 9.1-10.

4. Acceptance Criteria

   a. Controls, interlocks, and travel limits function as specified in the electrical schematics.

   b. Cranes and hoists demonstrate 100 percent operational capacity.

14.2.12.1.60 Off-gas

1. Objectives

   a. To verify the operation of the off-gas system including the recombiner, glycol cooler condenser, filters, and hydrogen analyzers.

   b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component tests are completed.

   b. Electrical power is available.

   c. Instrument air and service air is available.

   d. Reactor Auxiliaries Cooling System is available.

   e. All applicable instrumentation has been calibrated.

3. Test Method

   a. Check the logic, interlocks, and controls.

   b. Check valve operation including isolation features.

   c. Check preheater and recombiner operation.

   d. Check condenser level control.

   e. Check operation of the hydrogen analyzers.

   f. Check refrigeration system of the charcoal adsorber subsystem.

4. Acceptance Criteria

   a. Controls, trips, and interlocks function as specified in the system electrical schematics.

   b. Remote operated valves operate as specified in the system electrical schematics.

   c. Mechanical equipment operation, including the recombiner and charcoal absorbers refrigeration subsystem meet the vendor technical instruction manual.

14.2.12.1.61 Liquid Radwaste

1. Objectives

   a. To verify the operation of the five process subsystems, including equipment drains, floor drains, regenerant waste, chemical waste, and detergent drain waste.

   b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component tests are completed.

   b. Ac and dc electrical power is available.

   c. The following support systems are available:

      (1) Instrument air

      (2) Service air

(3) Heating steam

(4) Condensate makeup

(5) Reactor auxiliaries cooling.

d. All applicable instrumentation has been calibrated.

3. Test Method

a. Check controls, logic, and interlocks.

b. Demonstrate the ability of filters to be precoated, backwashed, recirculated, and placed in normal operation.

c. Demonstrate the ability to transfer solids to the high integrity container after the RWCU phase separators have been decanted, using representative waste streams.

d. Demonstrate that the filters and demineralizers produce acceptable water quality, using representative waste streams.

e. Demonstrate flow capacities and flow paths of liquid radwaste components and subsystems.

f. Demonstrate the isolation features of the waste stream in conjunction with the process radiation monitoring system.

4. Acceptance Criteria

a. Flow capacities of pumps meet the requirements within industry standards listed in Section 11, Table 11.2-14.

b. Controls, logic, and interlocks, function as specified by the system electrical schematics.

c. Containment isolation valve closing time is as specified in Table 6.2-16.

d. Filter and demineralizer precoat and backwash performance is as specified in the vendor technical instruction manual.

e. Waste demineralizer effluent quality is as specified in the GE preoperational test specification.

f. The Liquid Radwaste System isolates as specified by the system electrical schematics and Section 11.5.

14.2.12.1.62 Solid Radwaste

1. Objectives

a. To verify that the Solid Radwaste System can collect and process wet and dry radioactive wastes.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Electrical power available.

b. Plant heating steam available.

c. Reactor auxiliaries cooling water and demineralized water available.

d. Component checks are completed.

3. Test Method

a. Check all logic, controls, and interlocks, associated with the solid radwaste system.

b. Check that the solid radwaste system can receive filter media, waste sludge, and/or resin slurries from the phase separators and spent resin tanks.

c. Check the packaging and drum handling features of the solid radwaste system.

d. Check the operation of the extruder/evaporator.

e. Demonstrate the operation of the dry waste hydraulic compactor.

4. Acceptance Criteria

a. Logic, controls, and interlocks, function as specified in the system electrical schematics.

b. Mechanical equipment, including the extruder/evaporator, the package and drum handling unit, and the dry waste compactor, function as specified in the vendor technical instruction manual.

c. Solidification samples are free of liquids.

14.2.12.1.63 Containment Instrument Gas

1. Objectives

   a. To verify that the Containment Instrument Gas System provides a supply of dry, oil free, filtered, compressed gas to components inside primary containment and to the MSIV sealing system (MSIV sealing system was deleted in 2001).

   b. To verify that the containment instrument gas system can be cross-connected with the plant instrument air system.

   c. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All component tests are completed.

   b. Safety auxiliaries cooling system is available.

   c. Electrical power is available.

   d. Systems served by containment instrument gas are available as required.

   e. All applicable instrumentation has been calibrated.

3. Test Method

   a. Check all controls, interlocks, and logic, associated with containment instrument gas.

   b. Check compressor operation, including unloading/loading cycles for lead/lag compressors.

c. Demonstrate that the system can provide dry, oil-free gas.

d. Demonstrate that the system can provide compressed gas to main steam SRVs, main steam MSIVs, TIP drive mechanisms, drywell/suppression chamber vacuum breakers, main steam sealing system (MSIV sealing system was deleted in 2001), and other gas operated valves inside containment.

e. Demonstrate that plant instrument air can be lined up to the containment instrument gas system from a remote location.

4. Acceptance Criteria

a. Controls, interlocks, and logic, function as specified in the system electrical schematics.

b. The containment instrument gas compressor provides compressed air with a 20 scfm capacity as specified in the Design Installation and Test Specification D3.42 and Table 9.3-6, page 2 of 3 as the dryer nominal capacity.

c. The dryer and filter efficiency is as specified in Section 9.3, Table 9.3-6 as determined by measurement to meet the criteria of ANSI MC 11.1-1975.

d. The Containment Instrument Gas System can provide compressed gas to the components stated in Section 9.3.6 as evidenced by the ability to increase the receiver pressure from 25 to 85 psig in 2 hours or less with the discharge valve closed.

e. The Plant Instrument Air System can be remotely lined up to the Containment Instrument Gas System.

14.2.12.1.64 Leak Detection

1. Objectives

To verify by integrated testing that the leak detection system properly monitors the reactor coolant pressure boundary, the primary containment, and areas external to primary containment for leakage. Portions of leak detection testing will be performed in applicable system preoperational tests in which the leak detection system has an interface.

2. Prerequisites

a. Component tests are completed.

b. Electrical power is available.

c. Interconnecting cables, panel power, local power, logic, controls, and alarms from the Leak Detection System to the following interfacing systems are available:

(1) Main steam system

(2) RWCU system

(3) Residual Heat Removal System.

(4) Reactor Core Isolation Cooling System

(5) Feedwater system

(6) High Pressure Coolant Injection System

(7) Ventilation and cooling systems within primary containment

(8) Core Spray System

(9) Nuclear Boiler System

(10) Reactor Recirculation System

d. All applicable instrumentation has been calibrated.

3. Test Method

a. Check all controls, logic, and interlocks, associated with the Leak Detection System.

b. Check integrated system actions and alarms resulting from leak detection devices by simulating or operating the following leak detection subsystems:

(1) Area temperature monitors (main steam, HPCI, RCIC, RHR, RWCU).

(2) Primary containment floor drain sump monitors.

(3) Primary containment equipment drain sump monitors.

(4) Injection line integrity monitors (RCIC/RHR, core spray, HPCI).

(5) Main steam line flow monitor.

(6) Drywell temperature monitors.

(7) Drywell pressure monitors.

(8) Drywell air cooler drain flow monitors.

(9) Drywell airborne gaseous radioactivity monitor.

(10) Reactor vessel head seal leakage monitor.

(11) Recirculation pump seal leakage monitor.

(12) Safety/relief valve temperature monitor.

(13) Reactor water low level monitor.

(14) HPCI/RCIC steam line flow monitors.

(15) Reactor Building sump flow monitors.

(16) RWCU differential flow monitor.

(17) Room flooding monitors (RCIC, HPCI, core spray, RHR, SACS, RACS, diesel generators, service water).

4. Acceptance Criteria

Trips, interlocks, and logic sequences function as specified in the system electrical schematics, the GE preoperational test specification and Section 5.2, Table 5.2-10.

14.2.12.1.65 Equipment and Floor Drainage

1. Objectives

a. To verify that the equipment and floor drainage systems associated with radioactive drainage can collect liquid wastes from their sources and transfer them to sumps or tanks.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component tests are completed.

   b. Electrical power is available.

   c. Water is available to test the operation of system pumps.

   d. All applicable instrumentation has been calibrated.

3. Test Method

   a. Check controls, logic, and interlocks, for system sumps, pumps, and valves.

   b. Operate the sump pumps to check performance.

   c. Demonstrate the flow paths of the contaminated drainage systems.

4. Acceptance Criteria

   a. Controls, logic, and interlock, for the drainage systems function as specified in the system electrical schematics.

   b. Pump performance meets the data shown in the vendor technical instruction manual.

   c. Flow paths are as specified in the system piping diagram.

14.2.12.1.66 Turbine Building Ventilation

1. Objective

   a. The test objective is to demonstrate the capability of the Turbine Building Ventilation System.

   b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated.

   b. All wiring continuity checks and megger tests have been completed.

   c. All motor alignments and run-ins have been completed.

   d. The appropriate ac and dc power sources are available.

   e. The SACS is in service.

   f. Preliminary Air Balance is sufficiently complete to support testing.

3. Test Method

   a. The system's automatic functions are verified for heating and cooling operations. The automatic dampers are verified for operation according to system design.

b. The ability of system fans to start on automatic start/standby signals.

4. Acceptance Criteria

a. Damper interlocks, trips, and permissives shall function as specified in the system electrical schematics.

b. Final air balancing has been completed.

14.2.12.1.67 Piping Vibration and Expansion

1. Objectives

To verify NSSS and BOP piping vibration and expansion falls within the criteria specified by the piping designers.

2. Prerequisites

1. Installation of piping is complete.

2. The system can support the requirements for flow.

3. Test Method

The test method is described in Section 3.9.2.

4. Acceptance Criteria

The acceptance criteria is discussed in Section 3.9.2. Acceptance criteria will be provided by the piping designers based on as-built drawings.

14.2.12.1.68 Reactor Building Ventilation

1. Objectives

   a. To verify that the Reactor Building Ventilation System (RBVS) can supply filtered air to specified areas of the reactor building.

   b. To verify the RBVS will maintain air flow from low to high potentially contaminated areas.

   c. To verify the RBVS can maintain space temperatures and pressures.

   d. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component checks are completed.

   b. Electrical power is available.

   c. Instrument air is available.

   d. Chilled water to cooling coils is available.

   e. All applicable instrumentation has been calibrated.

3. Test Method

   a. Check all logic, controls, and interlocks, associated with the RBVS.

   b. Check operation of dampers and fans.

c. Check that air flow paths are from low to high potentially contaminated areas.

d. Demonstrate that the RBVS can maintain negative pressure with respect to the outdoors.

e. Check that the RBVS will isolate on high containment pressure, reactor water low level 2, and high building radiation signal.

f. Check that equipment air unit coolers for RHR, core spray, HPCI, RCIC, SACS, and the steam tunnel can remove design heat loads. This is accomplished by extrapolation of data taken during preoperational test, and using a heat removal capacity calculation.

4. Acceptance Criteria

a. Logic, controls, and interlocks, function as specified in the system electrical schematics.

b. Supply and exhaust fans perform as specified in Table 9.4-7.

c. Air flow travels from areas of lesser contamination to areas of greater contamination.

d. Isolation dampers will close in time specified in Section 9.4.2.2.7.

e. RBVS isolates on high containment pressure, reactor water low level 2, and high building radiation signal.

f. The RBVS can maintain the Reactor Building at a negative pressure with respect to outdoors.

g. Equipment area unit coolers will remove design heat loads (RHR, core spray, HPCI, RCIC, SACS, steam tunnel).

h. Balancing of air flows and exhaust filtration and adsorption unit testing has been completed. The filtration and adsorption unit test shall have met the recommendations of Regulatory Guide 1.140 using ANSI N510-1980.

14.2.12.1.69 Condensate Storage and Transfer

1. Objectives

   a. To verify the condensate transfer system can provide water to the refueling floor subsystems such as the reactor cavity and dryer/separator storage pool.

   b. To verify the operation of the condensate transfer pumps and jockey pumps.

   c. The condensate storage tank as a source to HPCI and RCIC is verified in the HPCI and RCIC preoperational tests.

   d. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All permanently installed equipment and instrumentation has been functionally checked and calibrated.

   b. AC power is available.

c. Demineralized water is available to fill the condensate storage tank.

d. Verification of flow paths to be accomplished during system flush.

3. Test Method

a. Valve logic and valve operating times are checked.

b. Logic, and interlocks are checked.

c. Pump performance is checked.

4. Acceptance Criteria

a. Logic, and interlocks function as specified in the system electrical schematics.

b. Pump performance is comparable to the head flow curves specified in the vendor technical instruction manual.

14.2.12.1.70 Steam Extraction and Feedwater Heater and Drains

1. Objectives

a. To verify the operation of the extraction non-return check valves.

b. To verify the operation of the low and high pressure heater level control system.

c. To verify the integrated logic associated with a turbine trip signal.

2. Prerequisites

   a. Instrument calibration and loop checks have been completed.

   b. Component tests have been completed.

   c. AC power is available.

   d. Instrument air is available.

3. Test Method

   a. Valve operation and valve logic tests are performed.

   b. Turbine trip logic associated with the level control valves and extraction non-return check valves are checked.

   c. Permissives and interlock logic are checked.

   d. Level control of feedwater heaters is checked by simulated heater level transients.

4. Acceptance Criteria

   a. Logic, including turbine trip and level control, functions as specified in the system electrical schematics.

   b. Valve operation is as specified in the vendor technical instruction manual.

14.2.12.1.71 Plant Chilled Water

1. Objective

   a. To demonstrate that the Plant Chilled Water System has the capability to supply chilled water for cooling to area unit coolers and designated components.

   b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. All component checks have been completed.

   b. Instrument calibration and loop checks have been completed.

   c. Makeup water from the demineralized water system is available.

   d. Turbine Auxiliary Cooling System (TACS) is available.

   e. Appropriate ac power and instrument air is available.

3. Test Method

   a. Each chiller unit and chilled water circulating pump is checked and proper operation verified.

   b. System controls, interlocks, and logic are checked.

   c. Flow is demonstrated to subsystems/components cooled by the plant chilled water system.

   d. Operation of containment isolation valves is checked.

4. Acceptance Criteria

   a. The chiller units operate as specified in the vendor technical instruction manual.

   b. The water circulating pumps operation meet the requirements specified in Table 9.2-6.

   c. System controls, and logic, function as specified in the system electrical schematics.

   d. Containment isolation valve stroke time is as specified in Table 6.2-16.

14.2.12.1.72 Steam Sealing

1. Objectives

   a. To verify that a supply of steam from the Auxiliary Steam System can be provided to the main turbine shaft seals, reactor feed pump shaft seals, and steam packing of the main stop control, bypass, and intermediate valves. Generation of steam by the steam seal evaporator will be accomplished during plant operation following fuel load.

   b. To verify the operation of the steam packing exhauster.

   c. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

   a. Component checks are completed.

   b. Instrument calibration and loop checks are completed.

c. AC power and instrument air are available.

d. The main condenser and turbine are available to apply sealing steam.

3. Test Method

a. Logic, controls, and interlocks are checked.

b. Steam seal evaporator level and pressure control subsystems are checked.

c. Auxiliary steam is applied to the main turbine and reactor feed pump seals, the steam packing exhauster is operated, and the steam seal system performance is checked.

4. Acceptance Criteria

a. Logic, controls, and interlocks, function as specified in the system electrical schematics.

b. In conjunction with the Main Condenser Air Removal Preoperational test, a vacuum can be drawn and maintained on the main condenser.

14.2.12.1.73 Heat Tracing and Freeze Protection

1. Objective

a. To verify that the heat tracing and freeze protection circuits as controlled from the master control panel are operable.

b. Alarms shall function in accordance with the system electrical schematics.

2. Prerequisites

a. Component checks are completed.

b. Instruments are calibrated and loop checks completed.

c. The phase II general test procedure for checking individual circuits prior to and after placement of insulation has been completed.

3. Test Method

a. Logic, controls, indication, and interlocks associated with the master control panel are checked.

4. Acceptance Criteria

a. Logic, controls, indication, and interlocks function as specified in the system electrical schematics.

14.2.12.1.74 GQ - Service Water Intake Structure Ventilation

1. Objective

a. The test objectives are to demonstrate that the Service Water Intake Structure Ventilation System can provide proper heating and cooling.

b. Instrumentation, alarms, and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment, relays, and instrumentation have been functionally operated and calibrated

b. Wiring continuity checks have been completed

c. Motor alignments have been completed

d. AC and DC power supplies are available

e. The heating units are operable

3. Test Method

a. All interlocks, trips, permissives, and controls are checked for proper operation

b. The heating and cooling subsystems are checked to operate upon receipt of high and low temperatures signals

c. Recirculation operation is checked

4. Acceptance Criteria

a. Logic, and controls function as specified by the system electrical schematics

b. System flow rates are as specified by FSAR Chapter 9, Table 9.4-18

14.2.12.1.75 AN - Makeup Demineralizer, Storage, and Transfer

1. Objective

a. The test objectives are to demonstrate the operation of the transfer system, the jockey pumps, level controls, and the ability of the makeup demineralizers to produce demineralized quality water.

b. Alarms and annunciators shall function in accordance with the system electrical schematics.

2. Prerequisites

a. All permanently installed equipment and instrumentation has been functionally checked and calibrated

b. Instrument control air is available

c. The demineralized water makeup system (or alternate water supply) is available.

d. AC power is available.

3. Test Method

a. The transfer and jockey pumps are tested to deliver their design flow rates

b. Controls, interlocks, and trips, are checked

c. Minimum flow rates and valve operation are checked

d. The water storage tanks automatic low level trip of pumps is checked

e. Makeup demineralizer rinse and regeneration cycles are checked

f. The ability to provide quality demineralized water at the effluent is checked.

4. Acceptance Criteria

a. Trips, and logic, function as specified in the system electrical schematics

b. Valve operation meets the requirements of the vendor technical instruction manual for the makeup demineralizers

c. Pump flow rates meet the flows specified in the vendor technical instruction manual

d. Makeup demineralizer rinse and regeneration cycles operate as specified in the vendor technical instruction manual

e. The effluent quality of the makeup demineralizers is as specified in Section 9.2.3.1.

14.2.12.2 <u>General Discussion of Startup Tests</u>

All tests associated with the startup test phase are discussed in Section 14.2.12.3. For each test, a summary is presented defining the test objective, prerequisites, test method, and acceptance criteria. Test objectives identify those operating and safety-related characteristics of the plant that are involved in the test.

The operating power flow map is presented as Figure 14.2-4. The test conditions are marked on Figure 14.2-4, and each test described in Section 14.2.12.3 is accomplished at the test conditions stated in Figure 14.2-5. These two figures represent the startup test schedule. The testing sequence generally runs from test condition 1 through test condition 6, with the exception that test condition 4 (natural circulation) is normally performed subsequent to the testing in test condition 5.

The startup test acceptance criteria are developed and approved by the design group organizations. In developing specific test acceptance criteria, the design groups will reference material such as:

1. FSAR Chapter 16, Technical Specifications
2. FSAR Chapter 15, Accident Analysis
3. Other FSAR sections
4. Vendor topical reports
5. Vendor technical documents
6. Design specifications
7. General Electric startup test specification.

The specific acceptance criteria will be listed in each startup test procedure. The criteria section of each test procedure has up to two sections, which are discussed below:

Level 1

If a Level 1 test criterion is not satisfied, the plant must be placed in a hold condition that is judged to be satisfactory and safe, based upon prior testing. Plant operating or test procedures, or the Technical Specifications, may guide the decision on the direction to be taken. Startup tests consistent with this hold condition may be continued. Resolution of the problem must immediately be pursued by appropriate equipment adjustments or through engineering support by offsite personnel if needed. Following resolution, the applicable test portion must be repeated to verify that the Level 1 requirement is satisfied. A description

of the problem resolution must be included in the report documenting the successful test.

Level 2

If a Level 2 test criterion is not satisfied, plant operating or startup test plans would not necessarily be altered. The limits stated in this category are usually associated with expectations of system transient performance, and whose characteristics can be improved by equipment adjustments. An investigation of the related adjustments, as well as the measurement and analysis methods, would be initiated.

If all Level 2 requirements in a test are ultimately met, there is no need to document a temporary failure in the test report; unless there is an educational benefit involved. Following resolution, the applicable test portion must be repeated to verify that the Level 2 requirement is satisfied.

If a certain controller related Level 2 criterion is not satisfied after a reasonable effort, then the control engineers may choose to document that result with a full explanation of their recommendations. This report must discuss alternatives of action, as well as the concluding recommendation, so that it can be evaluated by all related parties.

During performance of startup tests, technical specifications override any test in progress if plant conditions dictate.

The following tests are exempted from the license condition requiring prior NRC notification of major test changes:

1. Steam Production (Section 14.2.12.3.18)

   Justification: The sole purpose of this test is to demonstrate the nuclear steam supply system provides sufficient steam to satisfy all appropriate warranties as

defined in the contract between General Electric and PSE&G.

2. Pressure Regulator (Section 14.2.12.3.20)

   Justification: The purpose of the test is to tune the pressure regulator control system, to demonstrate the backup pressure regulator, and to demonstrate smooth pressure control transition between the bypass valves and the turbine control valves. This system is classified as a power generation system and is not a safety-related system, does not fulfill a general design criteria, and is not subject to 10CFR50 Appendix B requirements.

3. Feedwater System - Water Level Setpoint Changes (Section 14.2.12.3.21)

   Justification: The purpose of the test is to tune the feedwater control system for all feedwater pump and valve configurations. This system is classified as a power generation system and is not a safety-related system, does not fulfill a general design criteria or is not subject to 10CFR50, Appendix B requirements.

4. Feedwater Pump Trip (Section 14.2.12.3.21)

   Justification: The purpose of this test is to verify that the reactor recirculation runback circuit activated by a feedwater pump trip will act to drop power within the capacity of the remaining feedwater pumps. The acceptance criteria for the test is simply that there is an avoidance to scram due to the runback circuit, thus providing a capacity factor improvement. This is not a safety-related circuit, does not fulfill general design criteria, and is not subject to 10CFR50, Appendix B requirements.

5. Turbine Valve Surveillance (Section 14.2.12.3.22)

Justification: The purpose of the test is to demonstrate acceptable procedures and maximum power levels for recommended periodic surveillance testing of the main turbine control, stop, and bypass valves without producing a reactor scram, thus providing a capacity factor improvement. This test does not prove a safety-related system or circuit, does not fulfill general design criteria, and is not subject to 10CFR50, Appendix B requirements.

6. Recirculation Flow Control (Section 14.2.12.3.27)

Justification: The purposes of this test are to adjust and demonstrate flow control capability and to determine that the electrical compensators and controllers are set for desired system performance and stability. This system is considered a power generation system and is not considered a safety system. No portions of this test fulfill a general design criteria, nor is this system subject to 10CFR50, Appendix B requirements.

7. Recirculation Pump Runback (Section 14.2.12.3.28)

Justification: This test is accomplished in conjunction with Feedwater Pump Trip Test. The justification is the same as that given for item 4 above.

8. Recirculation system Cavitation (Section 14.2.12.3.28)

Justification: The purpose of this test is to show that the recirculation system flow will be runback to prevent operation in areas of potential cavitation to protect installed plant equipment. The test does not address any nuclear safety-related concern, does not fulfill a general

design criteria, and the runback circuit is not subject to 10CFR50, Appendix B requirements.

9. Reactor Water Cleanup (RWCU) (Section 14.2.12.3.32)

Justification: The purpose of the test is to demonstrate specific aspects of the mechanical operability of the RWCU system, including NPSH to the RWCU pumps, non-regenerative heat exchanger performance, and bottom head flow indication. The test does not prove any safety-related aspects of the RWCU system, such as system isolation. Additionally, the test does not fulfill general design criteria, nor do functions of the test fall under 10CFR50, Appendix B requirements.

14.2.12.3 Startup Test Procedures

14.2.12.3.1 Chemical and Radiochemical

1. Objectives

The tests provide verification of the sample systems' ability to:

a. Maintain quality control of the plant systems' chemistry and ensure that sampling equipment, procedures, and analytical techniques supply the data required to demonstrate that fluids meet quality specifications and process requirements

b. Monitor fuel integrity, operation of filters and demineralizers, condenser tube integrity, operation of the offgas system and steam separator dryer, and tuning of system monitors.

2. Prerequisites

Instrument calibration and preoperational testing of chemical, radiation, and radiochemical monitors have been completed.

3. Test Method

Prior to fuel loading, a complete set of chemical and radiochemical samples are taken to ensure that all sample stations are functioning properly and to determine the initial concentrations. During reactor heatup and power ascension, samples are taken and measurements made at each major power level test plateau to determine the chemical and radiochemical quality of the reactor coolant, amount of radiolytic gas in the steam, gaseous activities after the air ejectors, decay time in the gaseous radwaste lines, and performance of filters and demineralizers.

4. Acceptance Criteria

Level 1:

The chemical, radiochemical, and water quality factors are maintained within the Technical Specifications, and Fuel Warranty limits. Gaseous, particulate, and liquid effluents' activities shall conform with Technical Specifications.

14.2.12.3.2 Radiation Measurements

1. Objective

The test objective is to monitor radiation at selected power levels during plant operation to ensure the adequacy of shielding for personnel protection, and to verify compliance with 10CFR20.

2. Prerequisites

Prior to fuel loading, a survey of natural background radiation is made at selected locations throughout the plant site.

3. Test Method

During reactor heatup and at selected power levels, gamma dose rates, and where appropriate, neutron dose rate measurements are made at specific locations around the plant including all potentially high radiation areas.

4. Acceptance Criteria

Level 1:

Plant radiation doses and personnel occupancy times shall be controlled consistent with the guidelines in 10CFR20.1.

14.2.12.3.3 Fuel Loading

1. Objective

The test objective is to load fuel safely and efficiently to the full core size.

2. Prerequisites

Section 14.2.10 (initial fuel loading) describes the prerequisites for commencing fuel loading.

3. Test Procedure

The fuel loading procedure includes tests performed during the fuel loading evolution, including subcriticality checks and shutdown margin demonstration.

4. Acceptance Criteria

Level 1:

The partially loaded core shall be subcritical by at least 0.38 percent ΔK/K with the analytically determined strongest rod fully withdrawn or by at least 0.38 percent ΔK/K with the reactivity equivalent of the strongest rod added by the withdrawal of other control rods.

14.2.12.3.4 Full Core Shutdown Margin

1. Objective

The test objective is to demonstrate that the reactor will remain subcritical throughout the first fuel cycle with the most reactive control rod fully withdrawn.

2. Prerequisites

The core is fully loaded and in the xenon-free condition.

3. Test Method

The shutdown margin demonstration is performed by withdrawing selected control rods until criticality is reached. The empirical data are used to correct calculated values to obtain true shutdown margin.

4. Acceptance Criteria

Level 1:

The shutdown margin measurement shall verify that the fully loaded, cold, xenon free core occurring at the most reactive time during the cycle remains subcritical with the analytically strongest control rod (or its reactivity equivalent) fully withdrawn by at least 0.38 percent $\Delta K/K$.

Level 2:

Criticality should occur within ~1.0 percent $\Delta K/K$ of the predicted critical.

14.2.12.3.5 Control Rod Drive System

1. Objective

The test objective is to obtain the baseline data for the CRD system, and to demonstrate that the system operates over the full range of primary coolant conditions, from ambient to operating.

2. Prerequisites

Preoperational testing of the CRD system has been completed and the system is ready for operation.

3. Test Method

The startup tests performed on the CRD system are an extension of the preoperational tests. Initial post fuel load tests with zero reactor pressure include position indication, normal insert/withdraw stroking, friction testing, and scram testing. Coupling checks are verified using station operating procedures. During initial heatup

to rated reactor pressure, scram tests of four selected CRDs are performed. At rated pressure, normal stroke and scram times are obtained and friction tests are performed. During power ascension the four slowest CRDs are measured for scram times following planned reactor scrams as detailed on Figure 14.2-5. Proper response of the CRD flow control valve will be verified using station procedures.

4. Acceptance Criteria

Level 1

The normal withdrawal speeds and scram times shall meet the requirements of the GE startup test specifications.

Level 2

The friction test results should meet the requirements of the GE startup test specifications.

14.2.12.3.6 Source Range Monitor Performance

1. Objective

The test objective is to demonstrate that the neutron sources, SRM instrumentation, and rod withdrawal sequences provide adequate information to achieve criticality and increase power in a safe and efficient manner.

2. Prerequisites

Fuel loading is complete, all control rods are inserted, and the CRD system is operational.

3. Test Method

With the neutron sources installed, source range monitor count rate data is taken and compared to the required signal count and signal count-to-noise count ratio. Source range data is taken during rod withdrawals to the point of criticality. Rods will be withdrawn in accordance with a pre-established withdrawal sequence. Movement of rods in a prescribed sequence is monitored by the RWM and RSCS which prevent out of sequence movement.

4. Acceptance Criteria

Level 1

There must be a neutron signal count-to-noise count ratio of at least two and a minimum neutron count rate of 0.7 counts/second on the required operable SRMs.

14.2.12.3.7 Rod Sequence Exchange

This Test Has Been Deleted

14.2.12.3.8 Intermediate Range Monitor Performance

1. Objective

The test objective is to determine the IRM system overlap with the SRMs and APRMs and adjust the IRMS as required.

2. Prerequisites

The reactor is critical and the IRM gains have been optimized.

3. Test Method

After criticality, and when the neutron flux level is sufficient, the IRM/SRM overlap is verified. Following the calibration of the APRM, the IRM gains are adjusted if necessary. If any adjustments are made, the overlap of the SRM and IRM is verified when flux levels are in the appropriate range.

4. Acceptance Criteria

Level 1:

Each IRM channel must be on scale before the SRMs exceed their rod block setpoint. Each APRM must be on scale before the IRMs exceed their rod block setpoint on the highest range.

Level 2:

Each IRM must be adjusted for at least a half decade overlap with SRMs and one decade overlap with APRMs.

14.2.12.3.9 Local Power Range Monitor Calibration

1. Objective

The test objective is to calibrate the LPRM.

2. Prerequisites

Reactor power and LPRM gains are sufficient to observe detector response. The process computer or other means are available for determining calibration factors.

3. Test Method

Core power is maintained at the specified level for a sufficient time to allow equilibrium conditions to be established. The process computer or an off-line calculation will compute the average heat flux and gain adjustment factor for each LPRM. Each LPRM is calibrated in accordance with the calibration procedure.

4. Acceptance Criteria

Level 2:

Each LPRM reading should meet the requirements of the General Electric startup test specifications.

14.2.12.3.10 Average Power Range Monitor Calibration

1. Objective

The test objective is to calibrate the APRM.

2. Prerequisite

The core is in a steady state condition at the desired power level and core flow rate. Instrumentation used to determine core thermal power has been calibrated.

3. Test Method

A heat balance is taken at selected power levels. Each APRM channel reading is adjusted to agree with the core thermal power as determined from the heat balance. In addition, the APRM channels are calibrated at the frequency required by the Technical Specifications.

4. Acceptance Criteria

Level 1:

a. The APRM channels must be calibrated to read equal to or greater than the actual core thermal power.

b. Technical specification limits on APRM scram and rod block must not be exceeded.

c. In the startup mode, all APRM channels must produce a scram at less than or equal to the thermal power setpoint required by technical specification.

Level 2:

With the above criteria met, the APRMs are considered accurate if they agree with the heat balance or the minimum value required based on TPF, MLHGR, and fraction of rated power to within the limits specified in the GE startup test specifications.

14.2.12.3.11 Process Computer

1. Objective

The test objective is to verify the performance of the process computer under plant operating conditions.

2. Prerequisites

Computer calculational programs have been verified using simulated input conditions. The computer room HVAC is operational and plant data is available for computer processing.

3. Test Method

During plant heatup and ascension to rated power, the NSSS and the balance-of-plant system process variables sensed by the computer become available. The validity of these variables is verified and the results of performance calculations of the Process computer and the balance-of-plant (BOP) are checked for accuracy.

4. Acceptance Criteria

Level 2:

a. The process computer performance codes calculating the minimum critical power ratio (MCPR), linear heat generation rate (LHGR), and maximum average planar linear heat generation rate (MAPLHGR), and an independent method of calculation shall not differ in their results by more than the value specified in the GE startup test specification.

b. The LPRM gain adjustment factors calculated by the independent method and the process computer shall not differ by more than the value specified in the GE startup test specification.

14.2.12.3.12 Reactor Core Isolation Cooling System

1. Objective

The test objective is to verify the proper operation of the RCIC over its required operating pressure range.

2. Prerequisite

Fuel loading has been completed and sufficient nuclear heat is available to operate the RCIC pump.

Instrumentation has been installed and calibrated.

3. Test Method

The RCIC system is to be tested in two ways:

a. By flow injection into a test line leading to the condensate storage tank (CST), and

b. By flow injection directly into the reactor vessel.

The set of CST injection tests consist of manual and automatic mode starts at 150 psig and near rated reactor pressure conditions. The pump discharge pressure during these tests is throttled to be approximately 100 psi to 250 psi above the reactor pressure to simulate the largest expected pipeline pressure drop. This CST testing is done to demonstrate general system operability and for speed controller tuning verification.

Reactor vessel injection tests follow to perform and verify the flow controller tuning and to demonstrate automatic starting from a hot condition.

After all final controller and system adjustments have been determined, a defined set of demonstration tests must be performed. Two consecutive reactor vessel injections starting from cold conditions in the automatic mode must satisfactorily be performed to demonstrate system reliability and a set of CST injections are done to provide a benchmark for comparison with future surveillance tests. "Cold" is defined as a minimum 72 hours without any kind of RCIC operation. Data will be taken to determine the RCIC high steam flow isolation trip setpoint while injecting at rated flow to the reactor vessel.

After the auto start portion of certain of the above tests is completed, and while the system is still operating, small step disturbances in flow demand are input (in manual and automatic mode) in order to demonstrate satisfactory response with the final control system settings. This is to be done at both low (above minimum turbine speed) and near rated flow initial conditions to span the RCIC operating range.

A demonstration of extended operation of up to two hours (or until steady turbine and pump conditions are reached or until limits on plant operation are encountered) of continuous running at rated flow conditions is to be scheduled at a convenient time during the startup test program.

Depressing the manual initiation pushbutton is defined as automatic starting or automatic initiation of the RCIC system.

4. Acceptance Criteria

Level 1:

a. Following automatic initiation, the pump discharge flow must be equal to or greater than rated flow as specified in Section 5.4.6 within the time specified by the GE startup test specification.

b. The RCIC turbine shall not trip or isolate during automatic or manual start tests.

Level 2:

a. The Turbine Gland Seal System is capable of preventing steam leakage to the environment.

b. The delta pressure setpoints for RCIC steam supply line high flow isolation trip shall be calibrated to the requirements of technical specifications using actual flow conditions.

c. To provide overspeed and isolation trip avoidance margin, the transient start speed peaks must not exceed the requirements of the GE startup test specification.

d. The speed and flow control loops are adjusted to meet the decay ratio specified in the GE startup test specification.

14.2.12.3.13 High Pressure Coolant Injection System

1. Objective

The test objective is to verify the proper operation of the HPCI over its required operating pressure range.

2. Prerequisite

Fuel loading has been completed and sufficient nuclear heat is available to operate the HPCI pump. Instrumentation has been installed and calibrated.

3. Test Method

The HPCI system is to be tested in two ways:

a. By flow injection into a test line leading to the condensate storage tank (CST), and

b. By flow injection directly into the reactor vessel.

The earlier set of CST injection tests consist of manual and automatic mode starts at 200 psig and near rated reactor pressure conditions. The pump discharge pressure during these tests is throttled to be approximately 100 psi to 250 psi above the reactor pressure to simulate the largest expected pipeline pressure drop. This CST testing is done to demonstrate general system operability and for speed controller tuning verification.

Reactor vessel injection tests follow to perform and verify the flow controller tuning and to demonstrate automatic starting from a hot condition. Depressing the manual initiation pushbutton is defined as automatic starting or automatic initiation of the HPCI system.

After all final controller and system adjustments have been determined, a defined set of demonstration tests must be performed. Two consecutive reactor vessel injections starting from cold conditions in the automatic mode must satisfactorily be performed to demonstrate system reliability and a set of CST injections are done to provide a benchmark for comparison with future surveillance tests. "Cold" is defined as a minimum 72 hours without any kind of HPCI operation. Data will be taken to determine the HPCI high steam flow isolation trip setpoint while injecting at rated flow to the reactor vessel.

After the auto start portion of certain of the above tests is completed, and while the system is still operating, small step disturbances in flow demand are input (in manual and automatic modes) in order to demonstrate satisfactory response with the final control system settings. This is to be done at both low (above minimum turbine speed) and near rated flow initial conditions to span the HPCI operating range.

A continuous running test is to be scheduled at a convenient time during the startup test program. This demonstration of extended operation should be for up to two hours or until steady turbine and pump conditions are reached or until limits on plant operation are encountered.

Turbine gland seal condenser system operation will be checked for steam leaks at the first opportunity at 150 psig and rated pressures, and during the extended run.

4. Acceptance Criteria

Level 1:

a. Following automatic initiation, the pump discharge flow must be equal to or greater than the rated flow, and within the time specified in Table 3.3.3-3 of the Technical Specifications.

b. The HPCI turbine shall not isolate or trip during automatic or manual start tests.

Level 2:

a. The speed and flow control loops are adjusted to meet the decay ratio specified in the GE startup test specification.

b. The turbine gland seal system is capable of preventing steam leakage to the atmosphere.

c. The delta pressure setpoints for HPCI steam supply line high flow shall be calibrated to technical specification requirements using actual flow conditions.

d. In order to provide overspeed and isolation trip avoidance margin, the transient start speed peaks must not exceed the requirements of the GE startup test specification.

14.2.12.3.14 Selected Process and Water Level Reference Leg Temperatures

1. Objectives

a. To ensure that the measured bottom head drain temperature corresponds to bottom head coolant temperature during normal operation.

b. To measure the reactor water level instrument reference leg temperature and recalibrate the affected indicators if the measured temperature is different than expected.

2. Prerequisites

System and test instrumentation have been installed.

3. Test Method

The bottom drain line temperature and applicable reactor parameters above are also monitored during planned recirculation pump trips to determine if temperature stratification occurs in the idle loop(s) and to assure that idle loop-to-bulk coolant temperature differentials are within Technical Specification limits prior to restarting the pump(s). The bottom drain line temperature and applicable parameters are monitored when core flow is 100 percent of rated flow.

A test is also performed at rated temperature and pressure under steady state conditions to verify that the reference

leg temperature of the level instrumentation is the value assumed during initial calibration. Recalibration will be performed if necessary.

4. Acceptance Criteria

Level 1:

a. The reactor recirculation pumps shall not be started unless the loop to loop delta temperatures and steam dome to bottom drain delta temperatures are within the technical specification limits.

Level 2:

a. During two pump operation at 100 percent core flow, the difference between the bottom drain line thermocouple and recirculation loop thermocouple is within the delta temperature required in the GE startup test specification.

b. The difference between actual reference leg temperature and the value used for calibration is less than the amount specified in the GE startup test specification.

14.2.12.3.15 System Expansion - NSSS

1. Objective

The test objective is to demonstrate that major NSSS components and piping systems are free and unrestrained with regard to thermal expansion.

2. Prerequisites

Fuel loading has been completed and cold plant data has been recorded (with the exception of those systems testable during the Preoperational Phase). Instrumentation required has been installed and calibrated. The system piping to be tested is supported and restrained properly.

3. Test Method

During heatup and cooldown, observations and recordings of the horizontal and vertical movements of major equipment and piping in the NSSS are made in order to ensure that components are free to move as designed. Adjustments are made if necessary to allow freedom of movement. Snubbers, whose testing requirements are governed by technical specifications, will be monitored for thermal movement. The systems to be monitored are listed in Section 3.9.2.

4. Acceptance Criteria

Level 1:

a. There shall be no evidence of blocking of the displacement of any system component caused by thermal expansion of the system.

b. The piping displacements at the established transducer locations shall not exceed the allowable values specified by the piping designer, which are based on not exceeding ASME Section III Code stress values. These specified displacements will be used as acceptance criteria in the appropriate startup test procedures.

Level 2:

a. All hangers and snubbers shall be within their normal operating range.

b. The displacements at the established transducer locations shall not exceed the expected values as provided by the piping designer.

14.2.12.3.16 Core Performance

1. Objective

The test objective is to evaluate the principal thermal and hydraulic parameters associated with core behavior.

2. Prerequisites

The plant is operating at a steady state power level.

3. Test Method

With the core operating in a steady state condition, the core performance evaluation is used to determine the following principal thermal and hydraulic parameters associated with core behavior:

a. Core flow rate

b. Core thermal power level

c. MLHGR

d. MCPR

e. MAPLHGR.

4. Acceptance Criteria

Level 1:

Core flow rate, core thermal power level, MLHGR, MCPR, and MAPLHGR not exceed the limits specified by the plant technical specifications.

14.2.12.3.17 Warranty Test

1. Objective

The test objective is to demonstrate that the NSSS steam production rate satisfies all appropriate contract warranties.

2. Prerequisite

The plant has been stabilized at rated conditions. All required instrumentation has been installed and calibrated.

3. Test Method

The plant is operated for 100 hours at rated conditions. During the 100-hour run, the steam production rate is measured.

4. Acceptance Criteria

Level 1:

The NSSS parameters as determined by using normal operating procedures shall be within the appropriate license restrictions.

Level 2:

The NSSS will be capable of satisfying the steam production requirements specified in the General Electric startup test specifications.

14.2.12.3.18 Pressure Regulator

1. Objectives

   a. To determine optimum pressure regulator setting to control transients induced in the reactor pressure control system.

   b. To demonstrate the takeover capability of the backup pressure regulator via simulated failure of the controlling pressure regulator.

   c. To demonstrate smooth pressure control transition between the turbine control valves and bypass valves.

2. Prerequisites

   Instrumentation has been checked and calibrated. The plant is at a steady-state power level.

3. Test Method

   The pressure setpoint is decreased rapidly and then increased rapidly by about psi. The response of the system is measured in each case. The backup pressure regulator is tested by simulating failure of the operating pressure regulator. The bypass valve is tested by reducing the load limit, which requires the bypass valves to open and control the bypass steam flow.

4. Acceptance Criteria

Level 1:

a. The transient response of any pressure control system related variable to any test input must not diverge.

Level 2:

a. The pressure response time from initiation of pressure setpoint change to the turbine inlet pressure peak should be less than that specified in the GE startup test specification.

b. Pressure control system deadband should be small enough that steady state limit cycles shall produce steam flow variations no greater than specified in the GE startup test specification.

c. For all pressure regulator transients the peak neutron flux/peak vessel pressure should remain below the scram settings by the margins specified in the GE startup test specification.

d. The ratio of the maximum to the minimum value of the incremental change in pressure control signal divided by the incremental change in steam flow shall meet the requirements of the GE startup test specification.

e. The decay ratio of each controlled mode of response should meet the requirements of the General Electric startup test specification.

14.2.12.3.19 Feedwater Control System

1. Objectives

   a. To evaluate and adjust feedwater controls.

   b. To demonstrate capability of the automatic core flow runback feature to prevent low water level scram following the trip of one feedwater pump at 100 percent power.

   c. To calibrate the feedwater speed controller and to verify that the maximum feedwater flow during pump runout does not exceed the flows assumed in Section 15.1.2.

   d. To demonstrate response to feedwater temperature loss.

   e. To demonstrate acceptable reactor water level control.

2. Prerequisite

   Instrumentation has been checked and calibrated as appropriate. The plant is operating at steady state conditions.

3. Test Method

   a. Reactor water level setpoint changes of several inches are used to evaluate and adjust the Feedwater Control System (FCS) settings for all power and feedwater pump modes. The level setpoint change also demonstrates core stability to subcooling changes.

b. From near 100 percent power, one of the operating feedwater pumps is tripped. The automatic recirculation runback circuit will reduce recirculation pump speed to drop power to within the capacity of the remaining turbine driven feedwater pumps. It is not expected that the reactor will scram on low water level.

c. The condensate/feedwater system will be subjected to a loss of feedwater heating. The initial power level will be approximately 80 percent prior to the start of the test. It is expected that the feedwater temperature decrease will be less than 100°F.

d. Feedwater pumps and turbine parameters are monitored during the power ascension to demonstrate operability within specifications. This test includes initial calibration of the speed controllers, and verification that maximum feedwater flows do not exceed the flows assumed in the FSAR.

4. Acceptance Criteria

<u>Level 1</u>:

a. The transient response of any level control system related variable must not diverge.

b. For feedwater heater loss, the maximum feedwater temperature decrease due to single failure is less than that specified in the GE startup test specification, and the increase in simulated heat flux cannot exceed the BOL predicted value in the Transient Safety Analysis Design Report by more than that specified in the GE startup test specification.

c. Maximum speed attained shall deliver flows consistent with the requirements specified by the GE startup test specification limits.

Level 2:

a. Level control system oscillatory modes of response, open loop dynamic response, response to step disturbances, and steady state operation shall meet the requirements specified in the GE startup test specification.

b. On the trip of one feedwater pump, the reactor shall avoid low water level scram by the margin specified by the GE startup test specification.

c. The maximum speed should be consistent with the requirements of the General Electric startup test specification.

14.2.12.3.20 Turbine Valve Surveillance

1. Objective

The test objective is to demonstrate the methods to be used and the maximum power level for routine surveillance testing of the main stop, control, and bypass valves.

2. Prerequisite

The plant has been stabilized at the required power level.

3. Test Method

Individual main stop, control, and bypass valves are manually cycled and reset at selected power levels. The response of the reactor is monitored and the maximum power

level conditions for the performance of this test are determined. The rate of valve stroking and timing of the closed-open sequence are chosen to minimize the disturbance introduced.

4. Acceptance Criteria

Level 2:

Peak heat flux, vessel pressure, and steam flow shall remain below scram or isolation trip settings by a margin consistent with the GE startup test specification.

14.2.12.3.21 Main Steam Isolation Valves

1. Objectives

   a. To functionally check the MSIVs at selected power levels.

   b. To determine isolation valves' closure times.

   c. To determine reactor transient behavior during and following simultaneous closure of all MSIVs.

2. Prerequisites

The plant has been stabilized at the required power level.

3. Test Method

   a. Individual closure of each MSIV is performed at selected power levels to verify functional performance and to determine closure times.

   b. A test of the simultaneous full closure of all MSIVs is performed at about 100 percent power. Operation

of the RCIC and HPCI systems and the relief valves is demonstrated. Reactor parameters are monitored to determine transient behavior of the system during the simultaneous full closure test. The reactor will immediately scram due to the actuation of the MSIV position switches. Recirculation pumps will trip if Level 2 in the RPV is reached. The feedwater control system will prevent the RPV water level from reaching the steam lines.

4. Acceptance Criteria

Level 1:

a. MSIV closure times shall be as specified in the GE startup test specification.

b. Following the full closure of all MSIVs, vessel pressure and heat flux level shall be as specified in the GE startup test specification.

c. The reactor must immediately scram and the feedwater control system must prevent the water from reaching the main steam lines following full closure of MSIVs from high power.

Level 2:

a. Peak neutron flux, vessel pressure, and steam flow shall remain below scram or isolation trip settings by a margin consistent with the General Electric startup test specification requirements when individually testing the MSIVs.

b. The RCIC and HPCI systems shall function in accordance with the GE startup test specification following the MSIV closure from high power.

14.2.12.3.22 Relief Valves

1. Objectives

a. To demonstrate proper operation of the main steam relief valves and verify that there are no major blockages in the relief valve discharge piping.

b. To demonstrate their leaktightness following operation.

2. Prerequisites

The reactor is on pressure control with adequate bypass or main steam flow to maintain pressure control throughout the relief valve opening transient.

3. Test Method

A functional test of each safety relief/valve (SRV) shall be made at rated reactor pressure between and 20 percent of rated thermal power. Bypass valve (BPV) response or electrical output response is monitored during the test. Test duration will be about seconds to allow turbine valves and tailpipe sensors to reach a steady state.

The tailpipe sensor responses will be used to detect the opening and subsequent closure of each SRV. The BPV or MWe response will be analyzed for anomalies indicating a restriction in an SRV tailpipe.

Valve capacity will be based on certification by ASME code stamp and the applicable documentation being available in the onsite records. Note that the nameplate capacity/pressure rating assumes that the flow is sonic. This will be true if the back pressure is not excessive. A major blockage of the line would not necessarily be offset and it should be determined that none exists through the BPV or MWe response signatures.

Vendor bench test data of the SRV capacity and setpoint is evaluated during preoperatinal testing. The acoustic monitoring subsystem will be monitored during the relief valve test program and planned reactor trips.

4. Acceptance Criteria

Level 1:

a. There should be positive indication of steam discharge during the manual actuation of each valve.

Level 2:

a. Decay ratio for pressure control variables is as specified in the GE startup test specification.

b. The temperature measured by thermocouples on the discharge side of the valves should return to the temperature recorded before the valve was open as required in the GE startup test specification.

c. During the functional tests, steam flow through each relief valve as compared to average relief valve flow is as specified in the GE startup test specification.

14.2.12.3.23 Turbine Trip and Generator Load Rejection

1. Objective

The test objective is to demonstrate the proper response of the reactor and its control systems following trips of the turbine and generator.

2. Prerequisites

Power testing has been completed to the extent necessary for performing this test. The plant is stabilized at the required power level.

3. Test Method

This test is performed at two different power levels in the power ascension program. For the turbine trip, the main generator remains loaded for a time so there is no rise in turbine generator speed, whereas, in the generator trip, the main generator output breakers open and residual steam will cause a momentary rise in turbine generator speed. This speed will be monitored during each test.

At test condition 6, a generator trip (load rejection) will be initiated by simulating a condition that will cause the generator output breakers to open. During the transient it is expected that the reactor will scram and the recirculation pump trip (RPT) breakers will open. It is not expected the HPCI or RCIC will initiate. Reactor water level, pressure, and heat flux will be monitored. The action of relief valves will be monitored.

A turbine trip will be performed at low power such that nuclear boiler system steam generation is just within bypass valve capacity. The purpose of this test is to demonstrate scram avoidance.

During both transients, main turbine stop, control, and bypass valve positions will be monitored. Prior to the low power turbine trip, bypass valve capacity will be determined.

4. Acceptance Criteria

Level 1:

a. For turbine and generator trips at power levels greater than 50 percent, the response times of the bypass valves shall be as specified in the GE startup test specification.

b. Feedwater control system settings must prevent flooding the main steam lines.

c. The reactor recirculation pump drive flow coastdown shall be as specified in the GE startup test specification.

d. The positive change in vessel dome pressure and heat flux must not exceed the limits specified in the GE startup test specification.

e. The total time delay from start of turbine stop valve motion or turbine control valve motion to complete suppression of electrical arc between the fully open contacts of the RPT circuit breakers shall be less than the limit specified in the GE startup test specification.

Level 2:

a. The bypass valve capacity shall be equal to or greater than that required by the GE startup test

specification, which compares bypass valve capacity to the accident analysis.

b. There shall be no MSIV closure during the first three minutes of the transient and operator action shall not be required during that period to avoid the MSIV trip.

c. For the turbine trip within bypass valves capacity, the reactor shall not scram for initial thermal power valves within that bypass valve capacity and below the power level at which trip scram is inhibited.

d. Low water level recirculation pump trip, HPCI and RCIC shall not be initiated.

e. Feedwater level control shall avoid loss of feedwater due to high level trip during the event.

14.2.12.3.24 Shutdown From Outside the Main Control Room

1. Objective

The test objective is to demonstrate that the reactor can be brought from an initial steady state power level to hot standby and that the plant has the potential for being safely taken to a cold shutdown condition from hot standby from outside the main control room.

2. Prerequisites

The plant is operating at the required power level.

3. Test Method

The test will be performed at a low power level and will consist of demonstrating the capability to scram and

initiate controlled cooling from outside the control room. The reactor will be scrammed from outside the control room after a simulated control room evacuation. Reactor pressure and water level will be controlled using SRVs, RCIC, and RHR from outside the control room during subsequent cooldown. The cooldown will continue until RHR shutdown cooling mode is placed in service from outside the control room. Alternatively, verification of satisfactory operation of RHR shutdown cooling mode from outside the control room may be done at some other, more convenient time during the startup program. In either case, coolant temperature must be lowered at least 50°F while in the shutdown cooling mode. During the shutdown cooling mode demonstration, cooling to the RHR heat exchanger via the safety auxiliaries cooling system and the station service water system will be accomplished from the remote shutdown panel. All other operator actions not directly related to reactor vessel level, temperature, and pressure control will be performed in the main control room. The plant will be maintained in hot standby condition for at least 30 minutes during the performance of this test.

4. Acceptance Criteria

Level 2:

During a simulated main control room evacuation, the ability to bring the reactor to hot standby and subsequently cool down the plant and control vessel pressure and water level shall be demonstrated using equipment and controls located outside the main control room.

14.2.12.3.25 Recirculation Flow Control

1. Objectives

   a. To determine plant response to changes in the recirculation flow.

   b. To optimize the setting of the master flow controller.

2. Prerequisites

   The reactor is operating at steady state conditions at the required power level.

3. Test Method

   With the plant at the mid power load line, the recirculation speed loops are tested using large plus and minus step changes and the speed controller gains are optimized.

   When the plant is tested along the 100 percent load line, the recirculation system shall be tested by inserting small plus and minus step changes in the local manual and master manual modes.

   During recirculation flow control testing at the mid-power and 100 percent load lines, no scrams due to neutron flux or heat flux transients are expected.

4. Acceptance Criteria

   Level 1:

   a. The transient response of any recirculation system related variable to any test input must not diverge.

Level 2:

a. A scram shall not occur due to recirculation flow maneuvers. Neutron flux and heat flux trip avoidance margins are as specified in the GE startup test specification.

b. The decay ratio of any oscillatory controlled variable must be less than that required by the GE startup test specification.

c. Steady state limit cycles shall not produce turbine steam flow variations greater than the values specified in the GE startup test specification.

d. In the scoop tube reset function, if the speed demand meter has not been replaced by an error meter, the speed demand meter must agree with the speed meter within the values specified in the GE startup test specifications.

14.2.12.3.26 Recirculation System

1. Objectives

a. To determine transient responses and steady-state conditions following recirculation pump trips at selected power levels.

b. To obtain recirculation system performance data

c. To verify that cavitation in the recirculation system does not occur in the operating region of the power/flow map.

d. To verify that the feedwater control system can control water level without causing a turbine

trip/scram following a single recirculation pump trip.

e. To demonstrate the adequacy of the recirculation pump restart procedure at the highest possible power level.

2. Prerequisites

The reactor is operating at steady state conditions at required power level.

3. Test Method

Single pump trips are performed at test condition 3 and 6. Dual pump trip is demonstrated at test condition 3. The one pump trip tests are to demonstrate that water level will not rise enough to threaten a high level trip of the main turbine or the feedwater pumps. The dual pump trip verifies the performance of the RPT circuit and the recirculation pump flow coastdown prior to the high power turbine generator trip tests. Single pump trips are initiated by tripping the pump motor breakers. Adequate margins to scrams and capability of the feedwater system to prevent a high level trip will be monitored. The two pump trip will be initiated by simultaneously tripping one RPT breaker to each recirculation pump using a test switch. The recirculation pump restart demonstrates the adequacy of the restart operating procedure at the highest possible power level.

At several power and flow conditions, and in conjunction with single pump trip recoveries, recirculation system parameters are recorded.

While at test condition 3, it will be demonstrated that the cavitation interlocks which runback the recirculation pumps on decreased feedwater flow are adequate to prevent operation where recirculation pump or jet pump cavitation can occur.

4. Acceptance Criteria

Level 1:

a. During recovery from one pump trip, the reactor shall not scram.

b. The two pump drive flow coastdown time constant following a dual recirculation pump trip is as specified in the GE startup test specification.

Level 2:

a. Neutron flux and heat flux scram, and reactor water high level trip avoidance margins are as specified in the GE startup test specification.

b. System performance parameters, including core flow, drive flow, jet pump M-ratio, core delta pressure, recirculation pump efficiency and jet pump nozzle and riser plugging criteria are as specified in the GE startup test specification.

c. Runback logic shall have settings adequate to prevent operation in areas of potential cavitation.

14.2.12.3.27 Recirculation System Flow Calibration

1. Objective

The test objective is to perform a complete calibration of the installed recirculation system flow instrumentation, including specific signals to the plant process computer.

2. Prerequisites

The reactor is operating at steady state conditions. The initial calibration of the recirculation system flow instrumentation has been completed.

3. Test Method

During the testing program at operating conditions required for rated flow at rated power, the jet pump flow instrumentation is adjusted to provide correct flow indication based on the jet pump flow. The flow-biased APRM/RBM system is adjusted to correctly follow core flow based on drive flow. Additionally, the total core flow and recirculation flow signals to the process computer will be calibrated to read these two process variables.

4. Acceptance Criteria

Level 2:

a. Jet pump flow instrumentation shall be adjusted such that the jet pump total flow recorder provides a correct core flow indication at rated conditions.

b. The APRM/RBM flow bias instrumentation shall be adjusted to function properly at rated conditions.

c. The flow control system shall be adjusted to limit maximum core flow to the value specified by the GE startup test specification.

14.2.12.3.28 Loss of Offsite Power

1. Objective

The objective of this test is to demonstrate the response of the reactor and electrical equipment and systems during a loss of offsite power.

2. Prerequisites

The standby diesel generators are in the auto-start mode, and the plant is operating at power.

3. Test Method

With the power plant synchronized to the grid at ≤20 percent power, all offsite power to the 13.8-kV ring bus will be tripped. This will simulate loss of offsite power.

Reactor water level and the operation of safety systems, including RPS, standby diesels, RCIC, and HPCI, will be monitored.

The loss of offsite power condition will be maintained for at least 30 minutes to demonstrate that necessary equipment, controls, and indication are available following loss of offsite power to remove decay heat from the core using only emergency power supplies and distribution systems.

4. Acceptance Criteria

Level 1:

a. All safety systems, such as the RPS, SDG, RCIC, and HPCI, function per design without manual assistance. HPCI and/or RCIC system action, if necessary, shall keep the reactor water level above the initiation level of core spray, LPCI, ADS, and MSIV closure.

Level 2:

a. Proper instrument display to the reactor operator shall be demonstrated, including power monitors, pressure, water level, control rod position, suppression pool temperature, and reactor cooling system status.

14.2.12.3.29 Piping Vibration Tests

1. Objective

The test objective is to verify that steady state vibration and transient induced pipe motion of systems discussed in Section 3.9.2 are acceptable.

2. Prerequisites

The system piping to be tested is supported and restrained properly. Instrumentation for monitoring vibration has been installed and calibrated, where applicable.

3. Test Method

This test is an extension of the preoperational test program. During steady state operation, designated pipes as delineated in Section 3.9.2 will be monitored for

vibration. Dynamic vibration measurements will be made on applicable piping following various plant and system transients as specified in Sections 3.9.2.1.2.3, 3.9.2.1.3, and 3.9.2.2.4.

4. Acceptance Criteria

Level 1:

The piping displacements at the established locations shall not exceed the limits specified by the piping designer, which are based on not exceeding ASME Section III Code stress values or ANSI B31.1 values. These acceptable vibration levels will be used as acceptance criteria in the appropriate piping vibration startup test procedures.

14.2.12.3.30 Reactor Water Cleanup System

1. Objective

The test objective is to demonstrate the operation of the RWCU system.

2. Prerequisites

The reactor has been operated at a near rated temperature and pressure long enough to achieve a steady state condition.

3. Test Method

With the reactor at rated temperature and pressure, process variables are recorded during steady state operation in two modes of operation of the RWCU system: blowdown and normal.

4. Acceptance Criteria

<u>Level 2</u>:

a. The performance data recorded during operation in the listed modes shall be acceptable as specified by the GE startup test specification.

b. Pump vibration as measured on the bearing housing and coupling end shall be less than or equal to the values specified in the GE startup test specifications.

14.2.12.3.31 Residual Heat Removal System

1. Objectives

a. To demonstrate the ability of the RHR system to remove residual and decay heat from the nuclear system, so that refueling and nuclear system servicing can be performed.

b. To demonstrate the capability of the RHR system to reduce the suppression pool temperature below the established limit immediately following a blowdown.

2. Prerequisites

Preoperational testing has been completed. Instrumentation has been checked or calibrated as appropriate.

3. Test Method

Two modes are tested to verify system capability under actual operating conditions. The modes to be tested are suppression pool cooling and shutdown cooling. During the

operations, the heat transfer rate is controlled to maintain acceptable cooldown rates. Data are recorded and reviewed to verify the satisfactory operation of the RHR system within design limits.

4. Acceptance Criteria

Level 2:

a. The RHR system performance in the suppression pool cooling mode and shutdown cooling mode meets the requirements of the GE startup test specification.

14.2.12.3.32 Drywell and Steam Tunnel Cooling

1. Objective

The test objective is to demonstrate, under actual operating conditions, satisfactory cooling of the drywell and steam tunnel, including concrete surrounding hot piping penetrations.

2. Prerequisites

Appropriate preoperational test have been completed. Power ascension testing is in progress. Representative penetrations have been instrumented.

3. Test Method

Drywell atmospheric, steam tunnel atmospheric and penetration temperatures are monitored and recorded during plant heatup and power operation up to rated power. Design temperature limits are verified to be met, and cooling system adjustments are made as required to maintain acceptable temperatures.

4. Acceptance Criteria

Level 1:

a. Drywell average air temperature shall not exceed the limits specified in the plant technical specifications.

Level 2:

a. The concrete temperatures surrounding hot piping penetrations during normal operation shall not exceed the allowable local area limit for normal operations, specified in Section 3.8.2.

b. Specific locations in the drywell shall not exceed the limits specified in Section 9.4.5.1, items 1, 2, 4 and 5.

3. The maximum steam tunnel air temperature shall meet the requirements of Section 9.4.2.1.(3).

14.2.12.3.33 Gaseous Radwaste System

1. Objective

The test objective is to demonstrate proper operation of the gaseous radwaste system over its expected operating range.

2. Prerequisites

Initial calibration of instrumentation has been completed. Power ascension testing is in progress.

3. Test Method

During power ascension testing at steady state conditions, gaseous radwaste system operational data for system flow, pressure, temperature, hydrogen concentration, and dewpoint are recorded. Adjustments will be made, if necessary, to meet acceptable system performance.

4. Acceptance Criteria

Level 2

System performance as verified by data analysis shall meet requirements specified in the Public Service test specification.

14.2.12.3.34 Water Level Measurement

This test was included in Section 14.2.12.3.14.

14.2.12.3.35 Penetration Temperature Test

This test was included in Section 14.2.12.3.34.

14.2.12.3.36 Safety Auxiliaries Cooling System

1. Objective

The test objective is to demonstrate that the Safety Auxiliaries Cooling System (SACS) performance margin is adequate to support engineered safety features equipment over their full range of design requirements.

2. Prerequisites

Initial instrument calibrations have been completed. The plant is operating at the required test condition.

3. Test Method

During the performance of the RHR shutdown cooling mode test, the SACS will also be evaluated to determine the heat removal capacity of the system and demonstrate the capability of achieving cold shutdown within the time specified in the design specification.

During normal operation, the SACS will be tested at various power levels to evaluate heat exchanger performance.

4. Acceptance Criteria

Level 1:

The SACS heat exchangers shall have sufficient heat removal capacity to meet the cooldown requirements specified in Section 9.2.2.1.1.a and 5.4.7.1.1.1.

Level 2:

The SACS heat exchangers shall meet or exceed the design heat removal capacity listed in Table 9.2-4.

14.2.12.3.37 BOP Piping Vibration and Expansion

BOP piping vibration testing is included in Section 14.2.12.3.31.

BOP Piping System Expansion

1. Objective

The test objective is to demonstrate that major components and piping systems throughout the plant are free and unrestrained with regard to thermal expansion.

2. Prerequisites

Fuel loading has been completed and cold plant data has been recorded. Instrumentation required has been installed and calibrated. The system piping to be tested is supported and restrained properly.

3. Test Method

During heatup, observations and recordings of the horizontal and vertical movements of BOP piping systems are made in order to ensure that components are free to move as designed. Adjustments are made if necessary to allow freedom of movement. Snubbers, whose testing requirements are governed by technical specifications, will be monitored for thermal movement. The systems to be monitored are listed in Section 3.9.2.

4. Acceptance Criteria

Level 2

a. There shall be no evidence of blocking of the displacement of any system component caused by thermal expansion of the system.

b. Inspected hangers shall not be bottomed out or have the spring fully stretched.

c. The position of the shock suppressors shall be such as to allow adequate movement at operating temperature.

d. The piping displacements at the established transducer locations shall not exceed the limits specified by the piping designer, which are based on not exceeding ASME Section III Code stress values.

These specified displacements will be used as acceptance criteria in the appropriate startup test procedures.

14.2.12.3.38 Confirmatory Inplant Test of Safety/Relief Valve Discharge

1. Objective

The objective of this test is to confirm assumptions and methodologies used in the plant unique analysis (PUA) (see a summary report in Appendix 3B) and show that the loads and structural responses documented in the PUAR for SRV discharge related loads are conservative compared to the responses which occur during actual SRV discharges.

2. Prerequisites

a. Power level should be sufficient to support steady steam flow, during the test duration, through SRV discharge line with normal plant operating pressure at the SRV.

b. Instrumentation for monitoring loads and structural responses has been installed and calibrated.

3. Test Method

A shakedown test will be conducted to verify the test setup is functioning properly. The testing will consist of single valve actuations (SVA) and subsequent consecutive valve actuations (CVA) of the same valve. Selection of the SRV discharge line used for testing will be based on NUREG-0763, "Guidelines for Confirmatory Inplant Tests for Safety Relief Valve Discharges for BWR Plants," recommendations. Data will be collected and analyzed by computer code to verify design analysis.

4. Acceptance Criteria

Level 1:

The peak pool boundary pressure during air clearing and steam discharge during the valve actuation is less than the predicted value specified in the PUAR.

14.2.13 SRP Rule Review

14.2.13.1 SRP 14.2, II, Regulatory Guide 1.68 Revision 2, August 1978: Initial Test Programs for Water-Cooled Nuclear Power Plants

HCGS complies with Regulatory Guide 1.68, with the following exceptions and clarifications:

1. Position C.1 provides the criteria for selection of plant features that are tested during the initial test program. At HCGS, testing is conducted on structures, systems, components, and design features as described in this section based on their safety-related functions.

   The objective of Regulatory Guide 1.68 is to describe the scope and depth of a test program required to ensure that plant structures, systems, and components perform satisfactorily in service. The basis for this Regulatory Guide is Appendix B to 10CFR50, which specifically applies only to testing the performance of safety-related functions. Therefore, this Regulatory Guide is applied only to plant structures, systems, and components that have safety-related function, defined as those plant features necessary to ensure the integrity of the RCPB, the capability to shut down the reactor and maintain it in a safely shutdown condition, or the capability to prevent or mitigate the consequences of accidents that could

result in offsite exposures comparable to the guideline exposure of 10CFR100.

Safety-related structures, systems, and components are identified as such in this section and are tested to meet the requirements of Regulatory Guide 1.68. Other systems and components within the plant are not safety-related may or may not be tested in accordance with the Regulatory Guide. Since the plant units that are not safety-related by definition do not compromise the safety-related aspects of the plant, it is not planned to test them to the Regulatory Guide.

2. Position C.7 and Section 1.h of Appendix C of Regulatory Guide 1.68 state that one of the objectives of the initial test program is to verify by trial use that the facility operating and emergency procedures are adequate.

   Because preoperational test procedures are intended to demonstrate system design criteria, they are conducted under system configurations and conditions different than those required by facility operating and emergency procedures. The use of plant procedures is outlined in Section 14.2.9.

3. Deleted.

4. Section 1 of Appendix A states that system vibration, expansion, and restraints may be verified by observation as allowed during Power Ascension Testing by Section 5.0.0 of Appendix A. This position statement does not apply to the vibration monitoring of reactor internals.

5. Appendix A, Paragraphs 1.a (1), 1.e and 1.h (1) concerns expansion and restraint tests. Comment:

General Electric BWRs have performed hot functional tests during initial heatup following fuel load. System expansion, hanger, seismic, and restraint checks not performed prior to fuel load will be performed during the initial heatup after fuel load or when system piping is at its normal operating temperature.

6. Appendix A, Paragraphs 1.a (3), 4.s and 5.p concerns vibration tests. Comment:

   During the preoperational test phase, the reactor internals will be inspected following flow through the vessel as part of the standard BWR test program. No further testing is planned following fuel load.

   Refer to 14.2.13.2 SRP, II-b., Regulatory Guide 1.20, Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing.

7. Appendix A, Paragraph 1.b (3) concerns standby liquid control system tests. Comment:

   Verification of proper mixing of the solution is not performed as part of the preoperational test program. Just prior to fuel load, the solution is mixed and sampled using the station operation procedures.

8. Appendix A, Paragraph 1.c, of Regulatory Guide 1.68 references Regulatory Guide 1.118. Compliance with Regulatory Guide 1.118, Periodic Testing of Electric Power and Protection Systems, is addressed in Section 1.8.120. Regulatory Guide 1.118 will be used as guidance for preoperational tests.

9. Appendix A, Paragraph 1.g (2), concerns testing the emergency ac power distribution system. Comment:

Emergency loads are tested with nominal voltage available at the Emergency AC Power Distribution System buses. The power source to these buses is either from offsite (normal) or onsite (standby). When the bus is supplied from the onsite source, the available voltage is maintained within specified limits to verify proper functioning and loading of the onsite source. Test abstracts are presented in Section 14.2.12.1.30, 14.2.12.1.32 and 14.2.12.1.33. Testing of emergency loads with maximum and minimum design voltage available is not considered necessary became the station distribution system is designed to maintain voltages to support starting and operating of loads within their design limits. The station distribution system has been analyzed in accordance with BTP PSB-1 to establish minimum and maximum voltages under several operating conditions with only the offsite source considered available. Actual test voltages at selected points on the station distribution system will be taken and compared with the calculated voltages to validate the analysis performed.

Appendix A, Paragraph 1.g (3) references Regulatory Guide 1.9. HCGS complies with Regulatory Guide 1.9 as discussed in Section 1.8.

10. Appendix A, Paragraph 1.h) concerns engineered safety features (ESFs). Comment:

    There is no practical way to verify the maximum heat removal capability of the ultimate heat sink (UHS). Flow paths are demonstrated to show the proper operation of equipment and structures used to transport the water to and from the ultimate heat sink.

11. Appendix A, Paragraphs 1.k (2) and (3) concerns radiation protection systems. Comment:

Preoperational testing of personnel radiation monitoring and survey equipment or laboratory equipment is not performed. Calibration tests are performed prior to core load in accordance with station procedures.

12. Appendix A, Paragraph 1, states that spiked samples should be used where necessary to verify the operability of radioactive waste handling and storage systems. The functional testing of these systems is accomplished without the use of spiked samples of typical media, use of which .is also not considered necessary to verify conformance to the design.

13. Appendix A, Paragraphs 1.m (4) and 1.0 (1) reference Regulatory Guide 1.104. Comment:

    Regulatory Guide 1.104 was withdrawn by the NRC on 8/22/79. During preoperational testing, the cranes will be verified to function in accordance with specifications. The controls, interlocks, and travel limits of the reactor building and fuel handling cranes are verified.

14. Appendix A, Paragraph 1.n (11) references Regulatory Guide 1.80 1.68.3). Refer to 14.2.13.5 for comments.

15. Appendix A, Paragraph 2.c, concerns functional testing of the reactor protection system. Comment:

    The Reactor Protection System will be functionally checked in accordance with the HCGS Technical Specifications prior to initial criticality using station surveillance and calibration procedures. The reactor protection system is shown to operate in conjunction with the control rod drive startup test, described in Section 14.2.12.1.8. Also, the reactor protection system is verified to operate following scheduled transient tests such as MSIV isolation and turbine trip/generator load rejection.

16. Appendix A, Paragraphs 2.d and 5.0, concerns leakage detection of the Reactor Coolant System. Comment:

    Setpoints related to Leak Detection high steam flow in HPCI and RCIC are verified and set as stated in Sections 14.2.12.3.12 and 14.2.12.3.13. Normal operation of leak detection systems, such as drywell equipment drain sump pump will be accomplished using station operating procedures.

17. Appendix A, Paragraph 2.e, references Regulatory Guide 1.56. Refer to 14.2.13.4 for comments.

18. Appendix A, Paragraph 4.m, concerns demonstration of the operability of the MSIV leakage control system. Comment:

    Following fuel load, there is no planned startup test of the MSIV leakage control system. The preoperational test demonstrates the operability of the system at design conditions. Testing following fuel load does not contribute any additional meaningful data. For historical purposes only - this system was deleted.

19. Appendix A, Paragraph 5.j, concerns rod runback and partial scram. Comment:

    Rod run-back and partial scram testing is not performed because the plant does not have this design feature.

20. DELETED

21. Appendix A, Paragraph 5.q, concerns failed fuel detection. Comment:

There are no startup tests of the failed fuel detection systems. Preoperational testing and periodic surveillance testing after fuel load ensure the proper operation of radiation monitoring systems used for isolation signals in case of gross fission product release. Data is recorded from these systems and used as baseline data.

22. Appendix A, Paragraph 5.s concerns the hotwell level control system. Comment:

Although there will be no startup test procedure designated hotwell level control, operation of the hotwell level control system will be verified using station operating procedures and monitoring hotwell level during Phase III startup testing.

23. Appendix A, Paragraph 5.g.g concerns the testing to determine the operability of equipment provided for ATWS. Comment:

The ATWS subsystems are thoroughly checked out logically and functionally during the preoperational test program, as described in Sections 14.2.12.1.2.3.f, 14.2.12.1.3.3.c, 14.2.12.1.4.3.d, 14.2.12.1.8.3.i, 14.2.12.1.9.3.g, and 14.2.12.1.10.3.d. RPT pump trips, which are ATWS related, are accomplished during Phase III testing, as discussed in Section 14.2.12.3.26.3.

24. Appendix A, Paragraph 5.i.i concerns reactor coolant flow control valve closure. Comment:

HCGS design does not incorporate the recirculation flow control valve; however, the runback of the reactor recirculation pumps for cavitation protection and loss of

feedwater pump is accomplished during Phase III testing, as discussed in Section 14.2.12.3.26.3.

14.2.13.2 SRP II.b. Regulatory Guide 1.20. Revision 2. May 1976: Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing

HCGS complies with Regulatory Guide 1.20, with the clarification that the HCGS reactor internals were tested in accordance with the provisions for nonprototype Seismic Category I plants. The results of the vibration assessment program are found in GE Licensing Topical Report NEDE-24057.

For discussion of the preoperational flow test and inspection program, see Section 3.9.2.6.

14.2.13.3 SRP II.g. Regulatory Guide 1.56. Revision 1. July 1978: Maintenance of Water Purity in Boiling Water Reactors

HCGS complies with Regulatory Guide 1.56. Water quality will be referenced for the flushing program in accordance with Section B, first paragraph.

14.2.13.4 SRP II.j. Regulatory Guide 1.80. Preoperational Testing of Instrument Air Systems. is addressed and reissued as 1.68.3. Regulatory Guide 1.68.3. Revision 0. April 1982: Preoperational Testing of Instrument and Control Air Systems

HCGS complies with Regulatory Guide 1.68.3, with the following exceptions and clarifications:

1. Deleted.

2. Position C.5 - Observation of branch line pressure during maximum system service is sufficient to ensure that total air demand is in accordance with system design.

3. Position C.6 - The Instrument Air System afterfilter is designed to remove 0.04 micrometer particles with 98 percent efficiency. The system is designed to permit preventive or corrective maintenance on one dryer and afterfilter train without affecting system operability. Therefore, quarterly replacement of the afterfilter assures that 3.0 micrometers. This satisfies requirement 4.2 of ANSI MC11.1-1975.

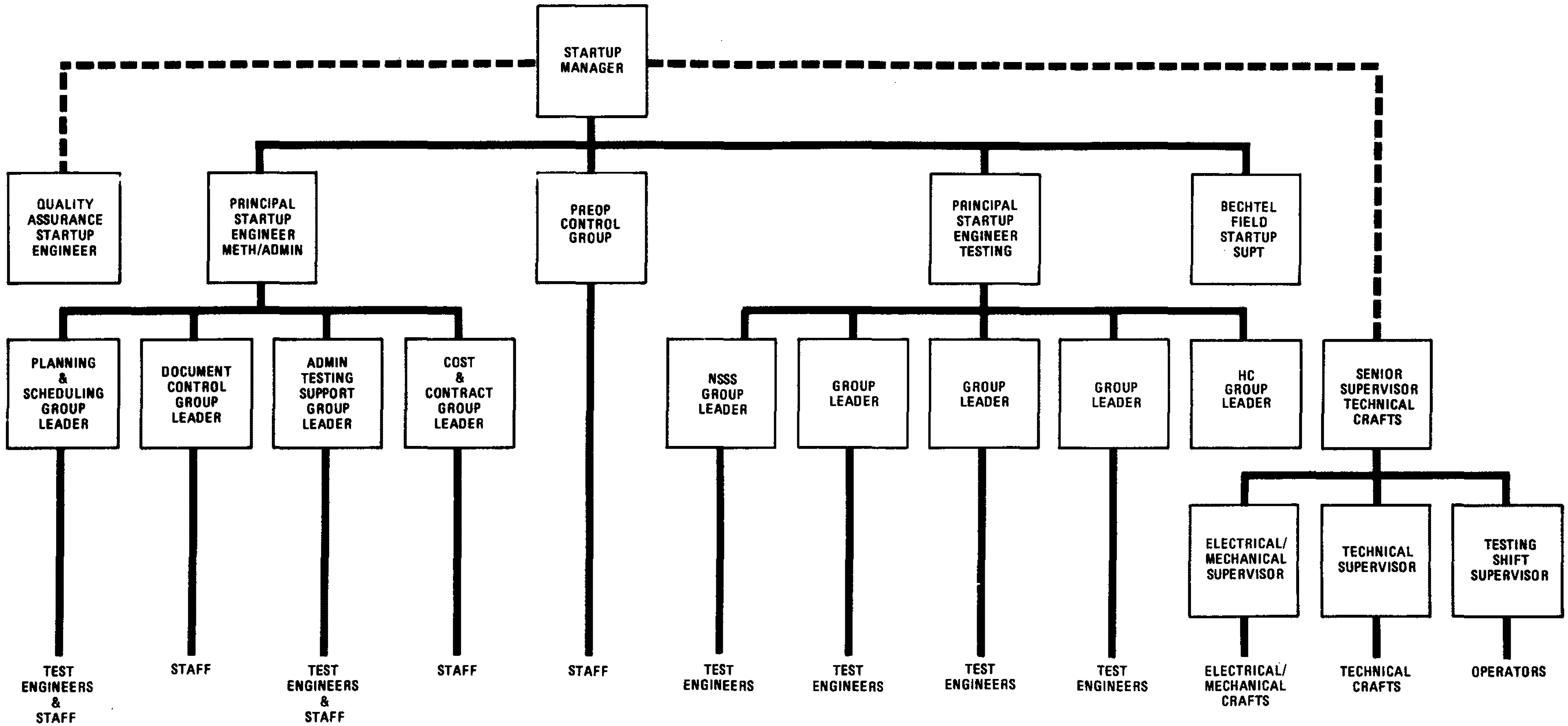
4. Positions C.7 and 8 - Each safety-related component is tested on an individual basis to ensure that the subject component responds safely to all failure modes.

5. Position C.10 - All safety-related air operated loads either fail to their safe position on loss of instrument air or are provided with an accumulator which ensures operation following a loss of air condition. Each safety-related component is tested on an individual basis to ensure that the subject components respond safely to failure mode.

6. Position C.11 - The Instrument Air System is provided with pressure relief valves which ensure that no safety-related components will be subjected to air pressure above their design value. Instrumentation has been provided to automatically trip compressors upon high air pressure in the receiver. Relief valve setpoints will be checked and instrumentation calibration completed prior to performing the preoperational test.

14.2.13.5 SRP II.e, Regulatory Guide 1.108, Revision 1, August 1977: Periodic Testing of Diesel Generator Units Used as Onsite Electric Power Systems at Nuclear Power Plants

HCGS complies with Regulatory Guide 1.108 as discussed in Section 1.8.



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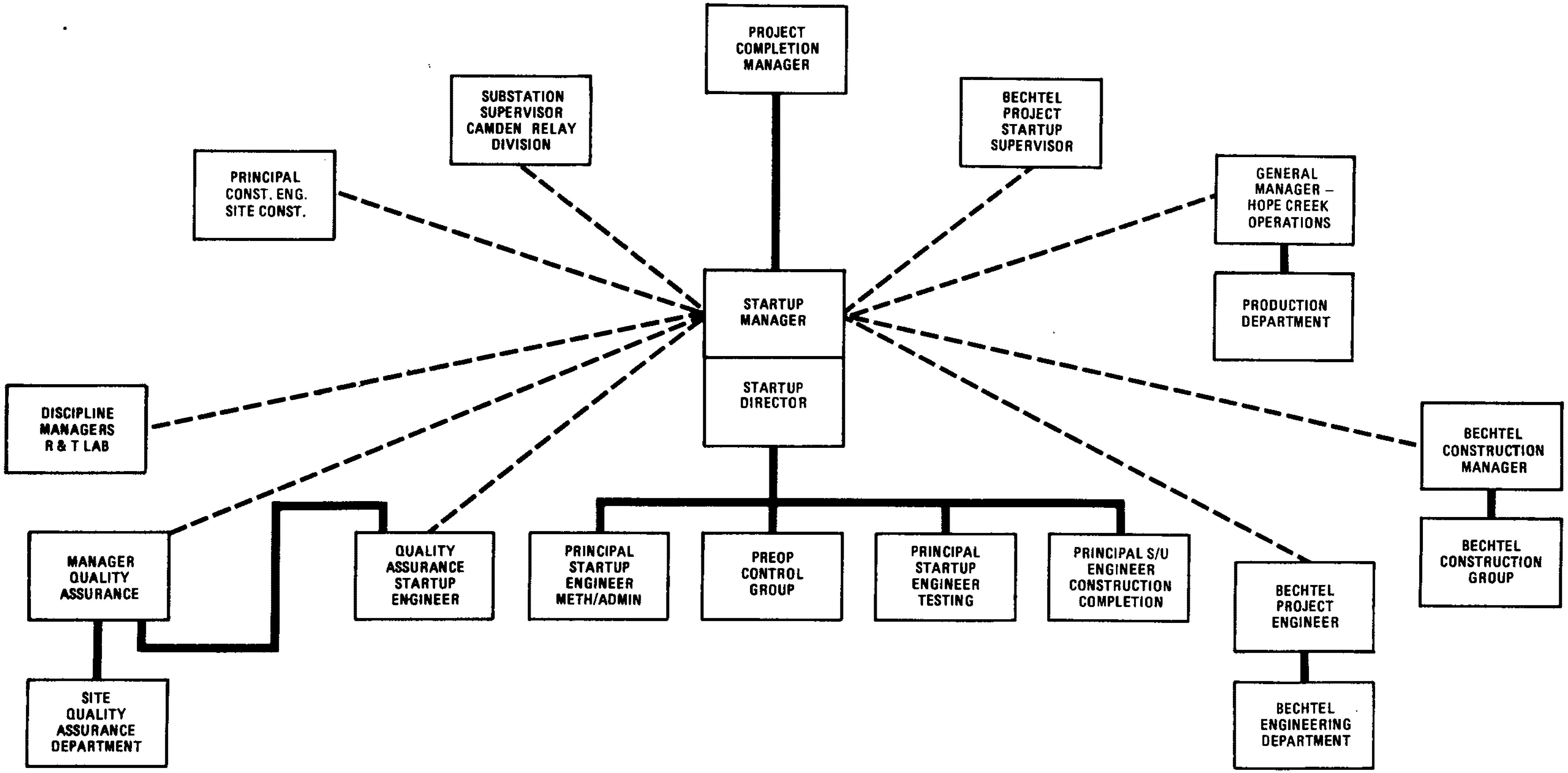
APRIL 11, 1988

PUBLIC SERVICE ELECTRIC AND GAS COMPANY
HOPE CREEK NUCLEAR GENERATING STATION

PUBLIC SERVICE
STARTUP GROUP ORGANIZATION

UPDATED FSAR

FIGURE 14.2-1



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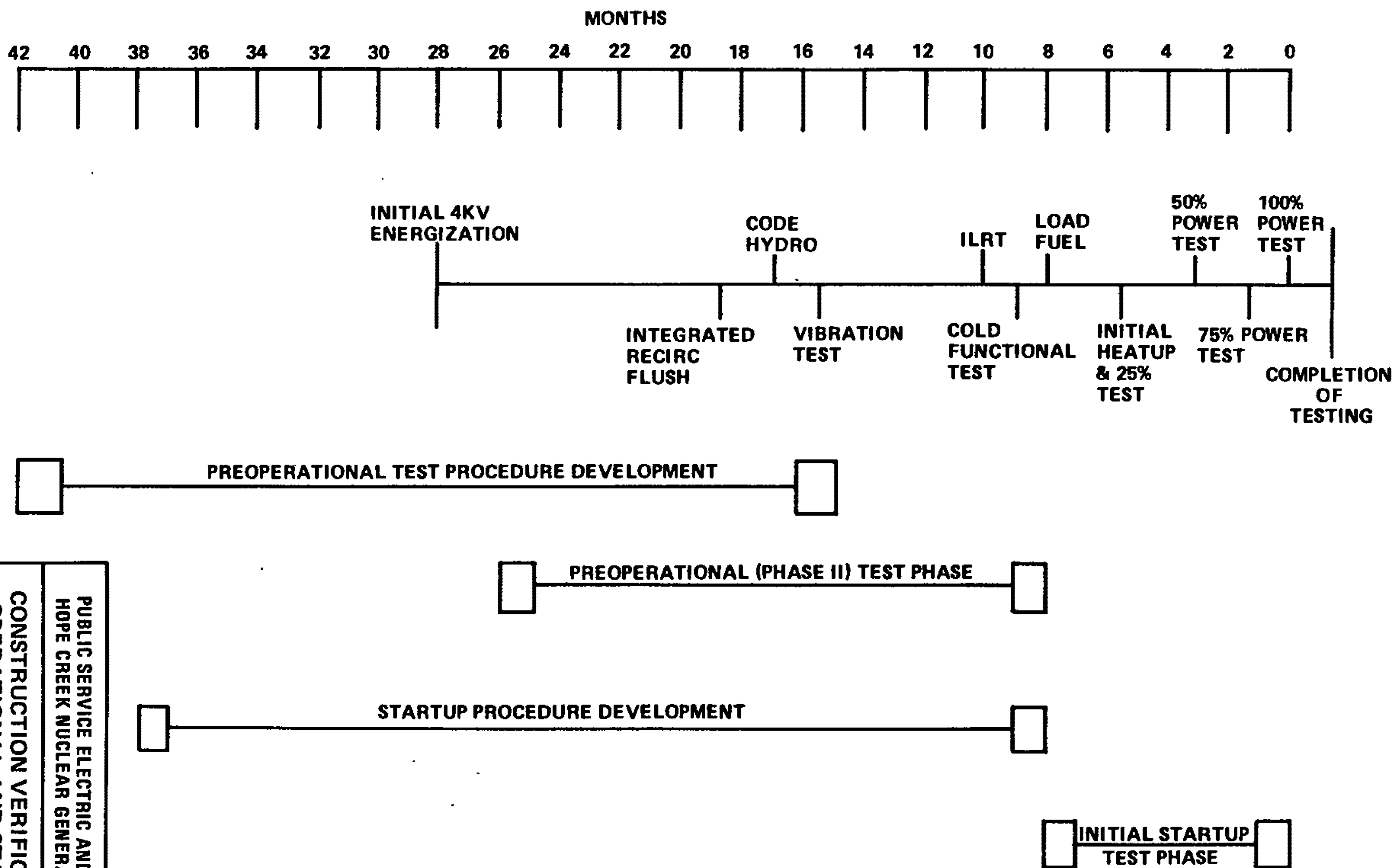
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
HOPE CREEK NUCLEAR GENERATING STATION

PUBLIC SERVICE
STARTUP GROUP INTERFACE

UPDATED FSAR

FIGURE 14.2-2



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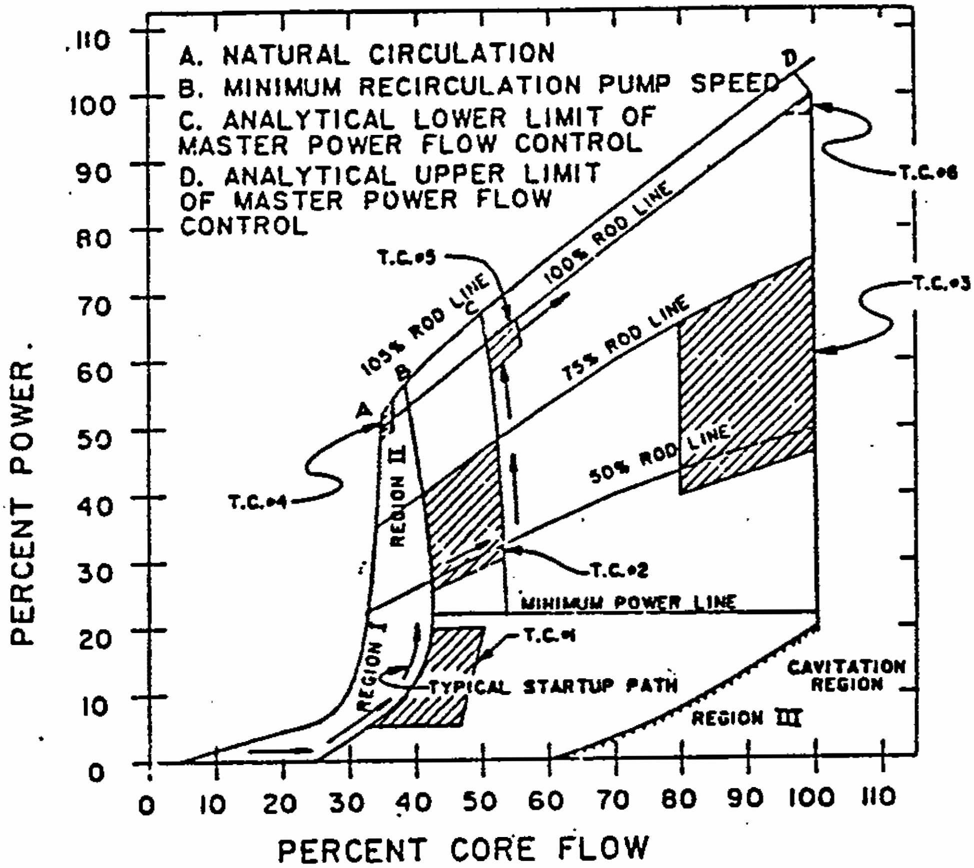
PUBLIC SERVICE ELECTRIC AND GAS COMPANY
HOPE CREEK NUCLEAR GENERATING STATION

CONSTRUCTION VERIFICATION, PRE-OPERATIONAL AND STARTUP TEST PROGRAM SCHEDULE

UPDATED FSAR

FIGURE 14.2-3



TEST CONDITION (TC) REGION DEFINITIONS

TEST CONDITION NO.	POWER-FLOW MAP REGION AND NOTES
1	BEFORE OR AFTER MAIN GENERATOR SYNCHRONIZATION BETWEEN 5.% AND 20.% THERMAL POWER-WITHIN ±10.% OF M-G SET MINIMUM OPERATING SPEED LINE IN LOCAL MANUAL MODE.
2	AFTER MAIN GENERATOR SYNCHRONIZATION BETWEEN THE 45.% AND 75.% POWER ROD LINES BETWEEN M-G SET MINIMUM SPEEDS FOR LOCAL MANUAL AND MASTER MANUAL MODES THE LOWER POWER CORNER MUST BE LESS THAN BYPASS VALVE CAPACITY.
3	BETWEEN THE 45.% and 75.% POWER ROD LINES – CORE FLOW BETWEEN 80% AND 100.% OF ITS RATED VALUE.
4	ON THE NATURAL CIRCULATION CORE FLOW LINE – WITHIN +0, -20% OF THE INTERSECTION WITH THE 100.% POWER ROD LINE.
5	WITHIN +0, -5% OF THE 100.% POWER ROD LINE – WITHIN 5.% OF THE ANALYTICAL OF THE LOWER LIMIT OF MASTER FLOW CONTROL.
6	WITHIN +0, -5% OF RATED 100.% POWER – WITHIN +0, -5% OF RATED 100.% CORE FLOW RATE.

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HOPE CREEK NUCLEAR GENERATING STATION

OPERATIONAL POWER/FLOW MAP

UPDATED FSAR

FIGURE 14.2-4

TEST NO. (22)	TEST NAME	OPEN VESSEL	HEAT UP	1	2	3	4	5	6
1	Chemical and Radiochemical	X	X	X		X			X
2	Radiation Measurement		X			X			X
3	Fuel Loading	X							
4	Full Core Shutdown Margin		X						
5	Control Rod Drive	X	X	X[2]	X[2]				X[2]
6	SRM Performance	X	X						
8	IRM Performance		X	X					
9	LPRM Calibration		X	X		X			X
10	APRM Calibration		X	X	X	X		X	X
11	Process Computer	X		X[3]		X			X
12	RCIC		X	X[24]					
13	HPCI		X	X[28]	X[28]	X		X[28]	X[28,29]
14	Selected Process Temp					X	X[4]		X
14	Water Level Ref Leg Temp		X			X			X
15	System Expansion	X	X	X					X
17	Core Performance			X	X	X	X	X	X
18	Steam Production								X
20	Pressure Regulator			X	X	X	X	X	X
21	Feed Sys – Setpoint Changes		X	X	X	X	X	X	X
21	Feed Sys – Loss FW Heating								X[5]
21	Feedwater Pump Trip								X[6]
21	Max FW Runout Capability								X[7]
22	Turbine Valve Surveillance							X[8]	X[10]
23	MSIV Functional Test		X	X[11]					
23	MSIV Full Isolation								X
24	Relief Valves			X, X[20]	X[20]				X[20]
25	Turbine Trip and Load Rejection				X[15]				X[17]
26	Shutdown Outside CRC				X[25]				
27	Recirculation Flow Control				X[14]			X[18]	
28	Recirc – One Pump Trip					X			X
28	RPT Trip – Two Pumps					X[19]			
28	Recirc System Performance				X	X	X		X
28	Recirc Sys. Cavitation					X			
30	Loss of Offsite Pwr				X[26]	X[26]			
31	Pipe Vibration		X	X	X	X	X		X
29	Recirc Flow Calibration					X			X
32	RWCU		X[23]						
33	RHR			X[23]					X[21]
34	Drywell and Steam Tunnel Cooling		X	X	X	X			X
35	Gaseous Radwaste			X		X			X
38	SACS Performance					X			X
39	BOP Piping Vibration and Expansion	X	X	X		X			X
40	Confirmatory In-Plant Test				X	X[27]	X[27]	X[27]	X[27]

FSAR 3/7

(1) Test conditions refer to plant conditions on Figure 14.2-4

(2) Perform Test 5, timing of 4 selected control rods, in conjunction with expected scrams

(3) Dynamic System Test Case to be completed between test conditions 1 and 3

(4) After recirculation pump trips (natural circulation)

(5) Between 80 and 90 percent thermal power, and near 100 percent core flow

(6) Max FW Runout Capability and Recirc Pump Runback must have already been completed

(7) Reactor power between 80 and 90 percent

(8) Reactor power between 45 and 65 percent and 75 and 90 percent

(9) Deleted

(10) At maximum power that will not cause scram

(11) Perform between test conditions 1 and 3

(12) Deleted

(13) Deleted

(14) Between test conditions 2 and 3

(15) Turbine trip, within bypass valve capacity

(16) Deleted

(17) Load rejection

(18) Between test conditions 5 and 6

(19) >50% power and >95 core flow

(20) Check SRV operability during major scram tests

(21) Performed during cooldown from test condition 6

(22) The test number correlates to FSAR Section 14.2.12.3.x where x is the indicated test number

(23) May be performed any time test conditions permit

(24) RCIC testing, if not previously performed

(25) The cold shutdown demonstration may be performed during a convenient shutdown from TC-1, 2, 3, 4, 5 or 6.

(26) Performed with the generator synchronized to grid at approximately 20% reactor power.

(27) May be performed anytime. Reactor power is greater than or equal to 25% during the start-up program.

(28) HPCI testing, if not previously performed.

(29) Second of two cold quick starts may be performed in TC-6 if first cold quick start in TC-3 is successful.

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TEST SCHEDULE AND CONDITIONS

UPDATED FSAR

FIGURE 14.2-5