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BUTLER,W. Licensing Branch 2

SUBJECT: Forwards proposed rev to FSAR Chapter 14 & draft revised responses to stated questions.Meeting within next 30 days requested.Tables deleted from chapter listed.Matl will be incorporated in future FSAR amend. See Rpts

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NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

August 7, 1985
(NMP2L 0465)

Mr. Walter Butler, Chief
Licensing Branch No. 2
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Mr. Butler:

Re: Nine Mile Point Unit 2
Docket No. 50-410

Enclosed is our proposed revision to Chapter 14 of the FSAR. We have had several informal telephone conversations with your staff concerning the scope of the revision. We anticipate incorporating this material in the FSAR in a future amendment, however, we request a meeting with your staff in the next 30 days. We expect that all outstanding questions can be resolved during this meeting, which will facilitate an expeditious review by your staff and keep the Unit 2 testing program on schedule.

In order to assist your review we have provided a complete version of Chapter 14 except for those Tables which have been deleted. The deleted Tables are:

14.2-2 thru 14.2-24, 14.2-26, 35, 37, 45, 66, 67, 70, 83, 84, 85, 87, 88, 89, 90, 91, 92, 93, 94, 96, 97, 98, 99, 111, 124, 127, 130, 205, 222, 229, 301, 401 and 402.

Also included in this package are draft revised responses to Questions 640.06, 640.08, 640.11, 640.13, 640.19, 640.22, 640.34, 640.34-2, and 640.35. In addition we have included the appropriate revised pages of Table 1.8-1.

During our previous discussions, your staff raised some concerns regarding the adequacy of some of our proposed test acceptance criteria. We believe that we understand your concerns and we are working on revising these areas. We will be prepared to present and discuss our proposed acceptance criteria during the review meeting with your staff.

Very truly yours,

C V Mangan

C. V. Mangan
Senior Vice President

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NIAGARA MOHAWK

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C. V. Mangan
Senior Vice President

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Project File (2)

TABLE 1.8-1 (CONT)

Regulatory Guide 1.58, Revision 1 (September 1980) (Cont)

Qualification of Nuclear Power Plant
Inspection, Examination, and Testing Personnel

FSAR Section 2.4

Position

The Unit 2 project complies with the Regulatory Postion (Paragraph C) of this guide through the alternate approaches described below and in Chapter 14.

BOP

The quality assurance program for Unit 2 is currently in compliance with Regulatory Positions C.5, 7, 8, and 10 of this regulatory guide. Regarding Regulatory Position C.6 of this regulatory guide and Section 3.5, Education and Experience Recommendations, of ANSI N45.2.6-1978, the following alternatives are proposed for personnel education and experience for each level:

3.5.1 Level I

1. Two years of related experience in equivalent inspection, examination, or testing activities, or

2. High school graduation/general education development (GED) equivalent and 6 months of related experience in equivalent inspection, examination, or testing activities, or

3. Completion of college-level work leading to an associate degree in a related discipline plus 3 months of related experience in equivalent inspection, examination, or testing activities.

4. Four-year college graduate plus 1 month of related experience or equivalent inspection, examination, or testing activities.

TABLE 1.8-1 (Cont)

Regulatory Guide 1.70, Revision 3 (November 1978)

Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants - LWR Edition

Position

The Unit 2 FSAR has been prepared following the format and content requirements contained in this regulatory guide, except in some cases where the content requirements were described or presented to conform to the Unit 2 established programs. The differences are not considered an exception as the material is presented in a manner consistent with the intent of this regulatory guide.

14.2 SPECIFIC INFORMATION TO BE INCLUDED IN FSAR - INITIAL TEST PROGRAM

14.2.1 Summary of Test Program and Objectives

The Nine Mile Point Unit 2 startup and test program consists of three phases which begin as systems and components and structures are nearing construction completion and ends with the rated power warranty run for the station.

The objectives of the startup and test program are as follows:

1. Ensure that the construction of the plant is acceptable.

2. Ensure that the initial test program is properly completed and documented.

3. Demonstrate, to the extent practical, that the plant structures, systems, and components operate in accordance with their design and performance requirements.

4. Utilize and evaluate, to the extent possible, the plant procedures.

5. Provide training and hands-on experience to the plant operating and maintenance personnel.

6. Demonstrate, where practical, that the plant is capable of withstanding anticipated transients and postulated accidents.

7. Effect a safe and efficient fuel loading.

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

The three major phases of the test program are intended to provide a systematic and controlled approach to plant startup. The three phases, preliminary testing, preoperational testing, and startup testing, are described in the following paragraphs. All three phases are conducted under the direction of NMPC with the preliminary and preoperational phases administratively controlled by the startup administration procedures (SAPs) and the startup phase by the site administrative procedures (APs).

14.2.1.1 Initial Test Program Phases

The three phases of the initial test program can be summarized as follows:

1. Preliminary testing - tests performed subsequent to release of the equipment, system, or structure from construction. This test phase verifies proper installation and operation of equipment, systems, and where applicable, structures. Preliminary test activities may be categorized into two phases:

    a. Component verification - includes cleaning, calibration, electrical logic and equipment tests, initial energizing, and equipment operation.

    b. System preparation - includes flushing and initial system operation.

2. Preoperational testing - performed after system turnover and usually prior to fuel load to verify that the performance of plant systems and components will meet applicable performance design and regulatory requirements. Two types of tests are included in the term preoperational testing:

    a. Preoperational tests - performed to provide verification that structures, systems, and components meet performance requirements and satisfy the design criteria to the extent possible. These tests are performed on safety-related systems as specified in Regulatory Guide 1.68, systems designated under the augmented Quality Assurance Program and other systems important to reactor safety or the safe shutdown of the reactor.

    b. Acceptance tests - similar to preoperational tests except they are performed on non-safety systems and are not specified in Regulatory Guide 1.68.

3. Startup testing - consists of fuel loading, precritical, low power, and power ascension tests that ensure fuel loading in a safe manner, confirm the design bases, demonstrate where practical that the plant is capable of withstanding the anticipated transients and postulated accidents,

and ensure that the plant is safely brought to rated capacity and sustained power operation.

14.2.1.2 Preliminary Testing

Typically, preliminary tests include, but are not limited to:

1. Valves

   a. Inspect, adjust packing and packing followers, check operator alignment, and verify lubrication.

   b. Verify and adjust motor-operated valve torque and limit switches, verify operation and control capability.

   c. Verify setpoints or bench test relief and vacuum valves.

2. Piping

   a. Verify installation and adjust hangers and supports.

   b. Verify completion and/or complete integrity testing.

   c. Hydrostatic testing.

   d. Flow balancing.

3. Flushing/cleaning

   a. Includes general flushing, proof flushing, wipe tests, and coupon tests.

   b. May include low velocity flushes to rinse or chemically clean pipe, vessel and tanks or high velocity to remove foreign material.

4. Rotating equipment

   a. Check anchoring, align and lubricate as necessary.

   b. Confirm correct rotation.

   c. Measure operating parameters.

5. Electrical circuits

   a. Verify annunciator operation.

   b. Verify control and interlock logic.

   c. Confirm equipment sizing.

   d. Verify installation, calibrate and set protective devices and relays and thermal overloads.

6. Instrumentation

   a. Calibrate instruments and process loops.

   b. Adjust setpoints.

   c. Verify instrument circuit continuity and operation.

14.2.1.3 Preoperational Test Phase

The preoperational test phase commences after system turnover which normally occurs as construction and preliminary testing near completion. During this period, some preliminary testing may be ongoing in addition to the preoperational tests. Plant operating and surveillance procedures are used to the extent practical during the preoperational test phase to operate the systems and to support the test program. In some cases, interim operating procedures may be used to operate systems and equipment during the preliminary and preoperational phases to compensate for nonstandard system conditions and/or to debug the intended operating procedure.

During this period, systems are operated in accordance with the preoperational or acceptance tests in which system parameters are tested, adjusted and recorded in as many modes of operation as can be simulated. The systems are also operated in conjunction with other systems during integrated tests to verify performance characteristics under near-actual operating conditions. The following are some of the types of data that may be checked and recorded during a preoperational test:

1. Design characteristics.

2. System interlocks.

3. Pump head, capacity.

4. System flows.

5. Heat-up characteristics, when attainable.

6. Tuning of system controls.

7. Response to simulated safety signals and/or loss of power.

8. Operating times.

This phase of testing verifies the ability of the plant to support fuel load and power operations.

14.2.1.4 Initial Startup Test Phase

The initial startup test phase commences with the receipt of the operating license and the preparation for fuel load and extends through the 100-percent rated power/100-hr warranty demonstration. The initial startup test phase is divided into six testing plateaus: open vessel (including fuel loading), heatup, low power, medium power, full power, and rated power warranty run. Testing performed during this phase of the program ensures that fuel loading is accomplished in a safe manner, confirms the plant design basis, demonstrates, to the extent possible, the plant's ability to withstand anticipated transients and postulated accidents and verifies that the plant can be safely brought to rated power and sustained power operations.

14.2.2 Organization and Staffing

The Unit 2 startup and test organization and interfaces to plant operations, SWEC, General Electric, and other selected NMPC organizations are shown in Figure 14.2-7 and are discussed in the following sections.

The Unit 2 operational organization is discussed in Chapter 13. The initial startup test phase is performed under the control of the Station Superintendent and coordinated by the Reactor Analyst. The responsibilities of the operations organization during the startup and test program are discussed in the following sections.

Staffing levels during the startup and test program will be commensurate with schedule and project needs and requirements.

14.2.2.1 Startup and Test Organization and Responsibilities

The startup and test organization, under the direction of the Startup Manager, has overall responsibility for the development, implementation, control, and conduct of the preliminary and preoperational phases of the Unit 2 test program. This organization is comprised of NMPC test engineers and technicians augmented by personnel from other NMPC organizations, Stone and Webster Engineering Corporation (SWEC), General Electric Company (GE), and others, as contractually established.

The Startup Manager reports to the Station Superintendent for the implementation and conduct of the test program and to the Project Director for startup and test activities in support of the project budget and schedule. During this period, the Unit 2 staff supports the test program as directed by the Startup Manager. Upon receipt of the operating license the Startup Manager and his staff support fuel load and the power ascension program, as directed by the Station Superintendent and Supervisor Operations.

14.2.2.1.1 Station Superintendent

The responsibilities of the Station Superintendent are discussed in Chapter 13. Additionally, included among his responsibilities, but not limited to, are the following startup and test program responsibilities:

1. Technical adequacy of the startup and test program and its compliance with NRC regulations and licensing commitments.

2. Approval of procedures during the startup test phase, as established in the technical specifications and APs.

3. Report test program status and problems to the NMPC General Superintendent Nuclear Generation.

4. Coordinate station department heads in their job assignments of plant staff to support and accomplish test program objectives.

5. Manage and direct the startup test phase of the plant.

14.2.2.1.2 Startup Manager

The responsibilities of the Startup Manager include the following:

1. Chairperson of the Joint Test Group (JTG).

2. Develop plans, schedules, methods, procedures, and data systems for the testing and evaluation of all plant equipment and systems to permit acceptance and licensing.

3. Provide management direction to the startup and test program, coordinate plant operations and all others involved in testing the plant to assure a thorough and efficient integration of the testing and operations efforts.

4. Manage and direct test program personnel relating to the attainment of startup and test program objectives.

5. Manage and direct assigned personnel in obtaining specifications and procedures to provide or assist in the establishment of qualitative and/or quantitative acceptance criteria.

6. Provide recommendations, dispositions, and effect corrective actions where equipment, system and/or program deficiencies could adversely affect the performance of safety-related functions.

7. Preparation and control of the Startup Administrative Procedures (SAPs).

8. Review and approval of preoperational tests and their results as the chairperson of the JTG.

9. Review and concur with all staffing requirements of the startup and test department.

14.2.2.1.3 Test Group Managers

Test Group Managers report to the Startup Manager. The responsibilities of a Test Group Manager include:

1. Represent the startup and test organization on the JTG.

2. Assume the responsibilities of the Startup Manager as described in Section 14.2.2.1.2 and the SAPs during his absence and any other duties specifically delegated.

3. Directing the preparation of program status and other startup and test program related reports.

4. Develop, monitor, and coordinate the preparation and implementation of plans, schedules, methods, and procedures for testing and evaluation of plant systems and components for verification of performance and acceptance.

5. Manage, direct, coordinate and monitor the activities of test personnel and others performing tests or other test program activities during the Startup and Test Program.

6. Identify problem areas and recommend and/or implement corrective actions where deficiencies could adversely affect the performance, safety-related functions or operating efficiency of plant systems or equipment.

7. Certification of test personnel.

8. Review and approval of preoperational and acceptance tests and their results as the startup and test member of the JTG, or as the designated alternate to the Startup Manager.

9. Review and approval of other test procedures and their results as procedurally established.

14.2.2.1.4 Lead Engineers

Lead Engineers report to a Test Group Manager. The responsibilities of a Lead Engineer include:

1. Provide discipline expertise, guidance, and direction to test personnel and others.

2. Review and approve test procedures and their results as procedurally established.

14.2.2.1.5 Test Group Supervisors

Test Group Supervisors report to a Test Group Manager. The responsibilities of a Test Group Supervisor include:

1. Review and evaluate test procedures, test results, and other documentation as procedurally established.

2. Ensure that systems and equipment are properly tested and operated.

3. Provide direction and guidance to test personnel.

14.2.2.1.6 Test Engineers

Test Engineers prepare and perform tests and inspections on plant systems and equipment, are responsible for all tests performed on their assigned systems, document deficiencies and their resolutions, provide corrective measures, methods and recommendations, as appropriate, for the correction of deficiencies and other problems. Test Engineers are assigned duties and certified commensurate with their technical background, experience, and prior satisfactory performance of assigned tasks.

1. A Level I Test Engineer generally assists other test engineers on their assigned systems. The extent of unassisted independent assignment is dependent on certification and past performance.

2. A Level II Test Engineer generally functions as a system engineer, performs all tests and inspections for which he is certified, and evaluates their results for acceptability and initiates corrective action, where appropriate.

3. A Level III Test Engineer performs the same functions as a Level II Test Engineer and additionally provides guidance and technical expertise to other Test Engineers and may provide reivew or approval of activities and their results as designated in the appropriate procedures or as delegated.

14.2.2.1.7 Test Support Personnel

Test support personnel assist the system engineer or other Test Engineer in the performance of startup and test activities.

1. A Test Support Person, Level I, performs limited startup and test activities under the direction, direct control, and/or supervision of the Test Engineer. These activities may include, but are

not limited to, data recording, test setup, performance, or direction of approved test procedures. The Test Engineer or other certified individual verifies and/or monitors the entire activity performed and assures that each step or portion was performed properly and is acceptable.

2. A Test Support Person, Level II, performs various tests and inspections based on certification and as directed by the Test Engineer. These activities do not require the Test Engineer to verify each step or portion of the activity. The Test Engineer monitors the process, provides overall direction, and determines the acceptability of the activity.

14.2.2.2 Startup and Test Program Staff Organization and Responsibilities

14.2.2.2.1 Project Advisory Engineer

The Project Advisory Engineer (PAE) is the senior SWEC Advisory Operations Division (AOD) representative on site. The PAE reports to the Startup Manager. The responsibilities of the PAE include:

1. Provide technical support and liaison with AOD and SWEC engineering and other SWEC organizations.

2. Represent SWEC on the JTG.

3. Manage the SWEC AOD Cherry Hill Operations Center (CHOC) support.

4. Conduct pressure test activities for ASME systems in accordance with SWEC's ASME III QA manual.

14.2.2.2.2 Startup Administrative Manager

The Startup Administrative Manager reports to the Startup Manager and is responsible to manage and direct the startup and test organization administrative, planning and scheduling, jurisdictional transfer, and turnover functions.

14.2.2.3 Station Staff Responsibilities During the Startup and Test Program

14.2.2.3.1 Plant Operations

Plant Operations consists of those personnel who operate Unit 2 under the direction of the Supervisor Operations, as described in Chapter 13. This group is responsible for the operation of plant equipment and systems during the startup and test program.

The startup test program is implemented by the plant operations department using procedures developed and approved in accordance with the APs. These procedures are prepared by members of the station staff and others as required under the direction of the Station Superintendent. Technical expertise from other organizations and GE is used whenever necessary.

14.2.2.3.2 Station Support Staff

The station support staff consists of those station personnel who maintain Unit 2. Duties and general responsibilities are provided in Chapter 13. The station support staff, under the technical direction of the Station Superintendent, supports the startup and test program by maintaining all plant equipment, systems, and structures after release to NMPC and by providing technical assistance and manpower support to the extent practical.

The station staff assumes complete control and responsibility for the operation, testing and maintenance of Unit 2 at fuel load.

The Reactor Analyst is responsible to the Station Superintendent for ensuring that all startup test phase procedures are written, reviewed, and approved; coordinating startup test phase testing; ensuring proper documentation of the startup test phase testing; and maintaining test results.

14.2.2.4 General Electric Company

14.2.2.4.1 Site Operations Manager

The GE Site Operations Manager (SOM) is the senior NSSS vendor representative on site at or near fuel loading and is the official GE spokesman for preoperational and startup testing concerns and requirements. He coordinates with the

Station Superintendent and the Startup Manager for the performance of his duties, which include the following:

1. Review of all NSSS test procedures, including changes and results.

2. Acts as liaison with GE on testing matters involving GE NSSS-supplied equipment.

3. Provide administrative support and supervision to GE onsite personnel involved in the test program.

4. Represent GE on the JTG.

14.2.2.4.2 Operations Superintendent

The GE Operations Superintendent is responsible to the GE SOM for the administrative and technical supervision of GE shift superintendents. The Operations Superintendent works directly with the NMPC Supervisor Operations and provides GE technical support to the operating organization.

14.2.2.4.3 Shift Superintendents

The GE Shift Superintendents provide technical support to the Unit 2 shift operations personnel in the testing and operation of GE supplied systems. They provide 24-hr/day shift coverage as required, beginning with fuel loading, and report to the GE Operations Superintendent.

14.2.2.4.4 Lead Engineer Startup Test, Design and Analysis (STD&A)

The GE Lead Engineer STD&A is responsible to the GE SOM for supervising the GE STD&A engineers, verifying core physics parameters and characteristics, and documenting that the performance of the NSSS and its components conform to acceptance criteria. He works with the Reactor Analyst or his representative to coordinate and effect implementation of the startup test program, including any special testing required to confirm these acceptance criteria.

14.2.2.4.5 GE Startup, Test, Design and Analysis Engineers

The GE STD&A engineers assist in the execution of the initial startup test phase.

14.2.2.5 Joint Test Group Membership and Responsibilities

The Joint Test Group (JTG) is a committee representing organizations responsible for the content, conduct and/or results of startup and test program activities during the preliminary and preoperational phases of the startup and test program. The JTG provides a coordinated independent technical review of procedures and their results, resolution to unacceptable items, identification of which item or items must be repeated or performed in addition to completed items or procedures to satisfactorily complete the test or activity. Some of the specific responsibilities of the JTG include:

1. Approval of all preoperational and selected preliminary test procedures and their revisions (see Section 14.2.3.2).

2. Approval of the results of all preoperational test procedures.

3. Ensuring the adequacy of test procedures and methods.

4. Ensuring that test procedures meet the requirements of the FSAR.

5. Approval of any contractor test procedures and their results when used to satisfy startup and test program requirements on safety-related systems.

6. Approval of the results of preliminary test procedures which satisfy preoperational test acceptance criteria.

The JTG membership and their individual responsibilities consist of the following:

14.2.2.5.1 Startup Manager

The Startup Manager is the chairman of the JTG. He is responsible to convene and conduct the meetings and to attempt to achieve a consensus from its membership.

14.2.2.5.2 Startup and Test

A Test Group Manager represents the startup and test organization and is responsible for providing a technical review of the proposed activities, documents and their results. The Test Group Manager serves as Chairman during the absence of the Startup Manager.

14.2.2.5.3 Plant Operations Representative

The Plant Operations Representative provides an operational review of the proposed activities, documents and their results. He additionally ensures that plant operating, emergency, and surveillance procedures are available as required to support the startup and test program.

14.2.2.5.4 NMPC Site Technical

The NMPC Site Technical Representative is responsible to review the JTG items for compatability with license commitments, general design requirements, technical specifications, surveillance, and operational assessment requirements. He additionally acts as liaison to the SORC, obtains SORC reviews as necessary, and communicates any SORC comments to the JTG.

14.2.2.5.5 Stone and Webster Engineering Corporation

The PAE represents SWEC on the JTG and is responsible for the SWEC engineering review of preoperational test acceptance criteria and other items within SWEC's scope of design.

14.2.2.5.6 General Electric Company

The GE Site Operations Manager represents GE on the JTG and is responsible for JTG agenda items within GE's scope of design for compatability with GE requirements.

14.2.2.5.7 Conditional Members

Conditional members are representatives from any organization having responsibility and/or expertise in an area of the JTG meeting agenda. In this situation, the representative will be requested to attend the meeting by the JTG Chairman.

14.2.2.6 Unit 2 Support of the Startup and Test Program

14.2.2.6.1 Unit 2 Project Management

The Unit 2 project management organization is managed and directed by the Project Director and is described in the PSAR. Support to the startup and test program is provided through the various project groups. Included in this support are such functions as:

1. Preparation, review, approval, and maintenance of the integrated project schedules.

2. Completion of construction activities in preparation for release and turnover of systems to NMPC.

3. Design control and control of design documents.

14.2.2.6.2 NMPC Quality Assurance

Project Quality Assurance

The NMPC Project Quality Assurance Organization is described in the PSAR. Additionally, the Project QA organization supports the startup and test program by reviewing and noting any outstanding construction QA documents associated with equipment and systems being turned over to NMPC and surveillance and/or reviewing documentation of construction activities performed on equipment released to NMPC.

Quality Assurance Nuclear

The Quality Assurance-Nuclear Organization is described in Chapter 17.

14.2.2.6.3 Stone and Webster Engineering Corporation

SWEC provides engineering services required for construction, system release and turnover, testing, and design-related problems discovered during the startup and test program. Additionally, SWEC reviews preoperational test procedure acceptance criteria and other items within their scope of design through the SWEC PAE.

14.2.2.6.4 General Electric Company

The General Electric Company is the supplier of the BWR nuclear steam supply system (NSSS) for Unit 2 and is responsible for generic and specific Unit 2 designs and the

supply of the NSSS. During the construction phase, the GE Resident Site Manager is responsible for all NSSS equipment disposition.

14.2.2.7 Site Operations Review Committee

The Site Operations Review Committee (SORC) is described in Chapter 13 and provides direction to the startup and test program by performing the following:

1. Review and approval of the SAPs governing the organizational makeup and responsibilities of the startup and test organization and the JTG.

2. Review of system preoperational test results after JTG approval for system acceptance and readiness to support plant operation.

3. Review and acceptance of initial startup test procedures and their results.

4. Authorizing the progressive levels of the power ascension program.

14.2.2.8 Qualifications

14.2.2.8.1 General

Personnel performing startup and test program activities are selected for their positions based on procedural requirements and as determined by the Startup Manager.

Related experience and training may be used to satisfy academic and experience requirements of each position/level on a one for one basis. However, when required, this time or training may not be used to satisfy other areas of qualification requirements.

14.2.2.8.2 Evaluation for Certification

When each individual is evaluated for certification and qualification, the following criteria are considered and where appropriate, noted on the individual's certification form:

1. Previous experience in the nuclear or related industry.

2. Candidate's past performance.

3. Demonstration of capability by actual performance, while under the guidance of a individual certified in the area(s), to evaluate the individual's ability to be certified to perform independently.

4. Oral and/or written exams.

5. Training and education.

6. Other factors/criteria, as appropriate.

Details for the certification of startup and test personnel during preliminary and preoperational testing are contained in the SAPs. During the startup test phase, all personnel are certified in accordance with the methods described in Section 14.2.2.8.9.

14.2.2.8.3 Startup Manager

The minimum qualifications of the Startup Manager (Level III) are a Bachelor's degree or equivalent in Engineering or related field and 10 years experience in power plant operations or testing, or an associate level education or equivalent and 12 years experience in power plant operations or testing. At least seven years should be nuclear. Previous experience in testing and supervisory/management roles during a preoperational test program is mandatory. The Startup Manager must have a good understanding of regulatory requirements, codes, and standards and must have the ability to communicate effectively in an oral and written capacity.

14.2.2.8.4 Test Group Manager

The minimum qualifications of a Test Group Manager (Level III) are a Bachelor's degree or equivalent in Engineering or related field and eight years experience in power plant operations or testing, or an associate level education or equivalent and ten years experience in power plant operations or testing. At least five years should be nuclear. Previous experience in testing and supervisory/management roles during a preoperational test program is mandatory. A Test Group Manager must have a good understanding of regulatory requirements, codes, and standards and must have the ability to communicate effectively in an oral and written capacity.

14.2.2.8.5 Lead Engineer

The minimum qualifications of a Lead Engineer (Level III) are a Bachelor's degree or equivalent in Engineering or related field and seven years experience in power plant operations or testing or an associate level education or equivalent and nine years experience in power plant operations or testing. At least four years should be nuclear. Previous experience in testing and supervisory/management roles during a preoperational test program is desirable. A Lead Engineer must have a good understanding of regulatory requirements, codes and standards related to his field or discipline and must have the ability to communicate effectively in an oral and written capacity.

14.2.2.8.6 Test Group Supervisor

The minimum qualifications of a Test Group Supervisor (Level III) are a Bachelor's degree or equivalent in Engineering or related field and five years experience in power plant operations or testing, or an associate level education or equivalent and seven years experience in power plant operations or testing. At least three years should be nuclear. Previous experience in a testing role during a preoperational test program is desirable. A Test Group Supervisor should have a good understanding of regulatory requirements, codes and standards and must have the ability to communicate effectively in an oral and written capacity.

14.2.2.8.7 Test Engineers

Test Engineer (Level I)

The minimum qualifications of a Test Engineer (Level I) are a Bachelor's degree or equivalent in engineering or related field, or an associate level education or equivalent and two years experience in power plant operations or testing. A Test Engineer, Level I, should have a general understanding of regulatory requirements, codes and standards as related to his activities and discipline and must have the ability to communicate effectively in an oral and written capacity.

Test Engineer (Level II)

The minimum qualifications of a Test Engineer (Level II) are a Bachelor's degree or equivalent in engineering or related field and two years experience in power plant operations or testing, or an associate level education or equivalent and four years experience in power plant operations or testing.

Previous experience in a testing role during a preoperational test program is desirable. A Test Engineer, Level II, should have a general understanding of regulatory requirements, and a good understanding of codes and standards as related to his activities and discipline and must have the ability to communicate effectively in an oral or written capacity.

Test Engineer (Level III)

The minimum qualifications of a Test Engineer (Level III) are a Bachelor's degree or equivalent in engineering or related field and four years experience in power plant operations or testing, or an associate level education or equivalent and six years experience in power plant operations or testing. At least two years should be nuclear. Previous experience in a testing role during a preoperational test program is desirable. A Test Engineer, Level III, should have a good understanding of regulatory requirements, codes and standards as related to his activities and discipline and must have the ability to communicate effectively in an oral or written capacity.

14.2.2.8.8 Test Support Personnel

Level I

The minimum qualifications of a Level I are a High School Degree or GED equivalent. Technical training or some on the job training for a particular discipline is desirable. A Test Support Person, Level I, should have a general understanding of the administrative and technical procedures and requirements, and any codes and standards relative to his activities and discipline and must have the ability to communicate effectively in an oral or written capacity.

Level II

The minimum qualifications of a Level II are a High School degree or GED equivalent and either technical training in a particular discipline and three years experience in power plant operations or testing, or five years-on-the job training for a particular discipline, and have demonstrated the ability to perform the activities for which they will be certified. A Test Support Person, Level II, should have a good understanding of the administrative and technical procedures and requirements, and any codes and standards relative to his activities and discipline and must have the ability to communicate effectively in an oral or written capacity.

14.2.2.8.9 Plant Personnel

Operating, maintenance or other unit or site personnel when performing normal plant operating, maintenance, etc activities are qualified in accordance with the requirements discussed in Chapter 13 and Section 1.8.

When plant unit or site personnel perform startup and test activities as described in the startup administrative procedures they shall be qualified and certified in accordance with their requirements.

14.2.2.8.10 Joint Test Group

JTG members are qualified to perform the duties and responsibilities of the JTG by their respective position qualifications and certifications.

14.2.2.9 Certification of Test Personnel

14.2.2.9.1 Certification Authorities

The Startup Manager is certified by the Station Superintendent and approved by the General Superintendent Nuclear Generation; Test Group Managers are certified by the Startup Manager and approved by the Station Superintendent.

All other startup and test personnel are certified by a Test Group Manager and approved by the Station Superintendent or Startup Manager.

14.2.2.9.2 Certification

Startup and test personnel are evaluated and certified based on the criteria and methods described in the SAPs. Each certification describes the area and level to which each individual is certified.

14.2.2.9.3 Recertification

Recertification and reevaluation of startup and test personnel are conducted, as a minimum, on a yearly basis.

14.2.3 Test Procedures

14.2.3.1 Test Procedure Development and General Information

The Unit 2 SAPs establish the methods for preparing, approving, revising and controlling preliminary, preoperational and acceptance test procedures. The site

administrative procedures (APs) establish the methods for preparing, approving, revising and controlling initial startup test procedures. Both also define and specify procedure content, format and style guidelines.

Test procedures are developed by startup and test, site/unit personnel and others, as required, utilizing the appropriate design documents, vendor information, codes, standards, etc. in order to provide detailed methods to demonstrate the capability of the equipment, systems and structures to perform their design functions.

14.2.3.1.1 Plant Procedures

The following program outlines the qualification and interface of plant operating procedures with the test procedures utilized during the startup and test program:

1. If required, procedures to operate equipment and systems and to support testing will have been prepared and approved before preoperational testing begins on the associated system using the best information currently available from the principal designer and responsible equipment suppliers.

2. Preoperational test procedures will utilize these procedures as nearly as possible (see Section 14.2.9).

3. Plant procedures required to support startup testing will be updated and revised, if previously drafted, developed, and approved utilizing the results of preoperational testing, including the use-testing of plant procedures where practical, before startup testing of the applicable systems. Exceptions will be those plant procedures required to be verified during the startup test phase.

4. Startup test procedures will either be updated, if already drafted, or developed utilizing the results of preoperational testing and the updated plant procedures.

14.2.3.2 Preliminary Test Procedures

Preliminary test procedures are developed and used to initially verify equipment, systems, and structures as described in Section 14.2.1.2. The format and content requirements are similar to preoperational test procedures and are described in the SAPs.

Preliminary test procedures that are utilized to verify safety-related functions of equipment or which will be used to satisfy a preoperational test procedure acceptance criteria and revisions are reviewed and approved by the JTG; all other preliminary test procedures are approved by a Test Group Manager.

14.2.3.3 Preoperational and Initial Startup Test Procedures

Preoperational and initial startup test procedure content is similar to that described in Regulatory Guide 1.68, the format varies but all the elements discussed in the guide are included.

All preoperational test procedures and their revisions are reviewed by the Quality Assurance - Nuclear Department for any applicable quality requirements.

All preoperational tests are approved by the JTG.

All startup test procedures and their revisions are approved by the General Superintendent Nuclear.

Review and approval of preoperational and startup test procedures is controlled in accordance with the SAPs and APs, respectively.

Figure 14.2-1 shows the review and approval cycle for preliminary and preoperational test procedures and Figure 14.2-2 shows the review and approval cycle of initial startup test procedures.

14.2.4 Conduct of Testing

14.2.4.1 Preliminary Testing

Preliminary testing is conducted in accordance with the SAPs under the control of Unit 2 Startup and Test Department subsequent to release of equipment, system, or structure from construction.

This test phase verifies proper installation and operation of equipment, systems, and where applicable, structures. At the time of the initial equipment run, the equipment and systems are operated by plant operations personnel as directed by the Test Engineer. Subsequent operation is under the control of the Station Shift Supervisor (SSS). To support test activities, these operations may be under the general direction of the Test Engineer. During these operations, operating parameters for equipment will be

monitored and recorded as necessary in accordance with the system operating procedures, interim operating procedures, or as determined by the SSS and/or Test Engineer to ensure that the operating envelopes of the equipment are not inadvertently exceeded.

Preliminary test procedures may be generic or specific type procedures. Generic tests are performed repetitively on groups or types of components and equipment. The range and installed systems may vary but the basic test method remains the same. During the performance of generic procedures the step-by-step details and sequence are determined by the Test Engineer. Specific procedures are applied to a limited scope and provide greater detail than generic procedures. Test results obtained during preliminary testing may be used in place of retesting during preoperational testing provided the preliminary test and its results are approved the JTG. These preliminary tests shall be identified in the preoperational test procedure.

14.2.4.2 Preoperational Testing

Preoperational testing on a system commences after the required preliminary testing of individual equipment, subsystems, or systems is completed. Testing is performed with preoperational test procedures approved in accordance with the SAPs.

Since a significant period of time may have elapsed between the time a preoperational test was approved and the time the test is to be performed, the test is reviewed prior to initiating the test; any changes in the equipment or system since the procedures approval are researched and the procedure revised as necessary in accordance with 14.2.3.3. The procedure may then be approved for performance by the Startup Manager.

14.2.4.2.1 Pretest Review

Approval by the Startup Manager to perform a preoperational test requires completion of a pretest review. This review includes, as a minimum, the following elements:

1. Review of the status of the procedurs (operating or other) required to support the test. The Startup Manager shall be notified if a required procedure is unavailable to support the test.

2. Attaching a copy of the system flow diagram for mechanical systems or an electrical one-line

diagram for electrical systems marked up with any design changes that are installed in the field but not yet incorporated on the drawing, to show system design configuration at the time of the test.

3. Check to ensure that the test prerequisites can be met.

14.2.4.2.2 Test Performance

Responsibilities

1. Implementation and scheduling all tests is the responsibility of the Startup Manager.

2. The performance of the test procedure, its direction, coordination and verification is the responsibility of the Test Director.

3. The responsibility for operation of systems and equipment, coordination of in process tests, maintaining and controlling plant operating status and assignment of operating personnel to assist in performance of the test procedures rests with the plant operations group through the on-duty SSS.

4. In emergencies, the Test Director or SSS are authorized to depart from approved procedures where necessary to prevent injury to personnel or the public or to prevent damage to the facility and its equipment.

Pretest and Preshift Briefings

Prior to test commencing, the Test Director and SSS discuss the test, its effects on other systems, control room indications, alarms, expected start and stop times, and any other factors that may influence test performance or plant conditions.

When the personnel that are to be involved in the test are assembled, the Test Director and SSS, if available, shall conduct a pretest briefing to explain the test and the involvement required of all participating personnel.

Additional briefings and updates are conducted for oncoming shift personnel and at other times as necessary during test performance by the Test Director.

Reverification of Prerequisites

Following a test interruption which results in a halt in testing during a preoperational test, the Test Director shall review the test prerequisites for possible reverification. The results of the review entered in the test summary and any reverified prerequisites listed.

Preoperational Test Summary

A preoperational test summary shall be prepared by the Test Director for all preoperational test procedures. The test summary includes significant events during the test, a description of any problems found during the test and reference to their resolution, any reverification of prerequisites required and an evaluation of the test results with reference to the acceptance criteria. This shall in particular note if any acceptance criteria have not been met. The test summary is attached to the record copy of the test procedure.

14.2.4.3 Initial Startup Testing

Startup testing is conducted by personnel from plant operations, startup and test, GE, and groups as required under the direction of the on-duty SSS in accordance with the APs.

During this phase, plant operating procedures are utilized in conjunction with the approved test procedures.

The final authority to start, continue, or end a test is the responsibility of the SSS after all required approvals have been obtained.

The master tracking system is used to ensure that prerequisites for initial fuel loading and the beginning of initial startup testing are fulfilled. In addition, each individual startup test procedure specifies prerequisites that must be validated prior to test performance. The on-duty SSS and respective test personnel ensure that all prerequisites are satisfied prior to performance of any initial startup test.

14.2.4.4 Modifications to Test Procedures During Testing

14.2.4.4.1 Preliminary Tests

Due to their nondetailed nature, field revision of generic preliminary tests is not applicable.

During performance, any changes to a specific preliminary test procedure that changes the intent, scope, or acceptance criteria of the test are made on a field revision form (FRF) prior to implementation of the change in accordance with the SAPs.

14.2.4.4.2 Preoperational Tests

During performance, no changes may be made to the procedure that change the intent, scope or acceptance criteria of the test without the prior approval of the JTG. These changes are made on an FRF in accordance with the SAPs. The Test Director may elect to perform unaffected sections of the test while awaiting resolution from JTG, provided test sequence is not mandatory.

Other exceptions and minor corrections to the test procedure are authorized in accordance with the SAPs.

14.2.4.4.3 Startup Tests

Modification to initial startup test procedures are classified as major or minor changes. A major change changes the intent of the procedure and requires development of a revision to the procedure. Such a revision requires approval of the organizations that originally approved the test procedure. When a procedure in progress cannot be followed or completed and a major change to the procedure is required, the test is held at that point, the system placed in a stable condition, and the necessary approvals obtained in accordance with the APs prior to continuing the test.

Minor changes do not change the intent of the test procedure and may be made with the concurrence of the duty SSS at the time the test is run. Minor changes to procedures are made in accordance with the APs which detail the method of entry of the change and the required approvals.

14.2.4.5 Modifications and Deficiencies

14.2.4.5.1 Preliminary and Preoperational Phases

The SAPs contain administrative controls for identifying, reporting, and tracking of deficiencies and modifications during these phases.

Changes to plant system and equipment design are reviewed and approved in the same manner as the original design by the approved design organization.

Deficiencies not requiring a change to the plant design are reviewed, resolved, approved, and corrected by the appropriate personnel in accordance with the SAPs.

To ensure the validity of test results during these phases, work on equipment after preliminary testing is administratively controlled by the SAPs. Control is accomplished by the use of work control documents and equipment tagging. The work control documents establish the scope, inspection and retesting required to complete the activity. Tagging is utilized to alert personnel that the equipment may be tested and in service and will require authorization prior to performing any work affecting the equipment.

14.2.4.5.2 Initial Startup Test Phase

Modifications and deficiencies during this phase are handled in accordance with the requirements established for the operational phase described in Chapter 13 and controlled in accordance with the APs.

14.2.5 Test Procedure Results Review and Approval

14.2.5.1 Preliminary Test Procedures

The Test Engineer reviews the results of each preliminary test to ensure it meets the requirements noted on the data sheet and/or procedure acceptance criteria. Where test results are unacceptable, the Test Engineer shall initiate steps to obtain corrective action as described in the SAPs.

A Lead Engineer reviews the results of all preliminary tests and approves the results of all generic preliminary tests. A Test Group Manager approves the results of all nongeneric preliminary test procedures.

Preliminary test results which require JTG approval are attached to their associated preoperational test for review and approval during the review and approval of the preoperational test results.

14.2.5.2 Preoperational Test Procedures

Completed preoperational test procedures are reviewed in accordance with the SAPs.

After the initial review, the preoperational test is submitted to the JTG for review and approval.

When the preoperational tests for a system are complete and approved by the JTG, the completed procedures are submitted to the SORC and Station Superintendent for review and acceptance.

Figure 14.2-3 shows the review and approval cycle for preliminary and all preoperational test results.

14.2.5.3 Initial Startup Test Procedures

The various startup test plateaus are described in Section 14.2.10. Startup test conditions are shown in Figure 14.2-5. The decision to proceed from one startup test plateau to the next will be based upon successful completion of the tests and the discretion of the SORC and General Superintendent Nuclear Generation. Any required retesting is determined during the review cycle. If a startup test is not fully acceptable, the SORC and General Superintendent Nuclear Generation can approve the procession to the next plateau in accordance with the APs.

The review and approval cycle for initial startup test procedure results is controlled in accordance with the APs and is shown in Figure 14.2-4.

14.2.6 Test Records

Test records and procedures are kept in accordance with the SAPs and APs which contain the generic procedures for filing and record keeping to be applied to test documentation.

14.2.7 Conformance of Test Program with Regulatory Guides

The Unit 2 startup and test program complies with the intent of the following regulatory guides with exceptions as noted or described in the appropriate sections of the FSAR. Areas where the guide(s) do not apply are not considered exceptions.

Regulatory Guide 1.9 - See Section 8.3.

Regulatory Guide 1.20 - The alternative approved for vibration testing of reactor internals will be in accordance with the provisions of Regulatory Guide 1.20 for nonprototype Category I plants.

Regulatory Guide 1.22 - See Chapter 7.

Regulatory Guide 1.30 - See Chapter 17.

Regulatory Guide 1.52 - The standby gas treatment system (SGTS) will be tested in accordance with Regulatory Guide 1.52 as described in Table 14.2-77. The design of the SGTS is described in Section 6.5.1. Alternative methods used to meet the intent of the regulatory guide are discussed in Section 1.8.

Regulatory Guide 1.58 - Startup and test personnel involved in testing meet the requirements of Regulatory Guide 1.58 and ANSI 3.1-1978 with exceptions as discussed in this chapter.

Unit 2 plant personnel meet the requirements of this regulatory guide as discussed in Chapter 13 and Section 1.8.

GE startup operations personnel supporting the startup test phase meet the requirements of this regulatory guide as discussed in Section 1.8 and Table 14.2-403.

Regulatory Guide 1.68 - Unit 2 complies with this regulatory guide with the exception of the format as described in Appendix C. The difference is not considered an exception however, as the guide specifies required elements while merely implying a format.

Regulatory Guides 1.68.1 and 1.68.2 - Unit 2 complies with Regulatory Guides 1.68.1 (Tables 14.2-27, 30, and 31) and 1.68.2 (Table 14.2-104).

Regulatory Guide 1.68.3 - Unit 2 complies with Regulatory Guide 1.68.3 as described in Section 1.8.

Regulatory Guide 1.108 - Unit 2 complies with Regulatory Guide 1.108 with the exception of the sequence discussed in Regulatory Position C.2.a.(5). Unit 2 will comply with the intent of this position by noting the stabilized operational parameters of the diesel generators at the completion of the test described in C.2.a.(3) during the diesel generator preoperational tests (Tables 14.2-125 and 126). Prior to performance of one the sections of the loss of power preoperational test (Table 14.2-129) in which the requirements of C.2.a.(2) will be verified, the diesel generators will be started, loaded and allowed to run until the same operating parameters have been reached and stabilized. The units will then be shutdown and the test performed while the equipment is still at operating temperatures.

Regulatory Guide 1.128 - See Section 8.3.2.

14.2.8 Utilization of Reactor Operating and Testing Experience in Development of Test Program

Since every reactor/plant in a GE BWR product line is an evolutionary development of the previous plant in the product line (and each product line is an evolutionary development from the previous product line), it is evident that the current plants have the benefits of experience associated with the successful and safe starting of 25 or more previous BWR plants. The operational experience and knowledge gained from these plants and other reactor types has been factored into the procedures related to the startup and test program.

Additionally, a committee of NMPC operations technical staff and staff engineers (technical services review) reviews reactor operating and testing experiences. The group routinely reviews Licensee Event Reports, information from the Nuclear Plant Reliability Data System (NPRDS), NRC I&E Bulletins, NRC Circulars, and NRC, INPO, and NSAC Information Reports. This group reviews test procedures for the startup and test program through the technical staff representative to the JTG and SORC. These same individuals continue to provide input to operations management after commercial operation.

14.2.9 Trial Use of Plant Operating and Emergency Procedures

To the extent practical throughout the startup and test program, test procedures utilize operating and emergency procedures where applicable in the performance of the tests. Additionally, after the equipment and systems have been initially tested and placed in service to support other test activities these procedures are utilized as applicable and to the extent consistent with the completion status of the equipment and system. The use of these procedures is intended to achieve the following:

1. Prove the specific procedure or identify where changes may be required.

2. Provide training of plant personnel in the use of these procedures.

3. Increase the level of knowledge of plant personnel of the systems being tested.

Test procedures may use these operating and emergency procedures by referencing the procedure directly or by extracting a series of steps from the procedure or they may

use a combination of both methods. A description and summary of plant procedures and a schedule for their development are given in Section 13.5.

14.2.9.1 Interim Operating Procedures (IOPs)

IOPs are utilized to trial test the station operating procedures and to allow operation of systems in nonstandard configurations during the test program due to incomplete testing or construction. IOPs are reviewed, approved, and revised in accordance with the SAPs.

14.2.10 Initial Fuel Loading and Initial Criticality

14.2.10.1 Fuel Loading and Shutdown Power Level Tests

Fuel loading and initial criticality are conducted in accordance with written procedures after the applicable prerequisite tests have been satisfactorily completed and an operating license has been issued. In the actual sequence for performing startup tests (SUTs) the tests are grouped into plateaus. All tests within a plateau will be completed, or justification given for exceptions, before proceeding to the next plateau (Sections 14.2.4.3 and 14.2.5.3). All exceptions must indicate a point at which resolution must occur before the test proceeds.

The normal sequence of tests within the program is as follows:

1. Core performance analysis.

2. Steady-state testing.

3. Control system tuning.

4. Major trips.

The actual testing sequence can vary from the recommended test sequence because of equipment problems and other considerations. Prior to approving fuel loading, certain actions must be verified by the steps in the following sections, which are performed at the completion of most of the preoperational testing.

14.2.10.1.1 Loss of Power Demonstration - Standby Core Cooling Required (Table 14.2-129)

This test demonstrates the capability of the emergency diesel generators to start automatically and assume all of the emergency core cooling loads in a loss of normal auxiliary power and the capability of the off-site power system to supply power to start and run emergency core cooling and selected normal loads during a simulated LOCA condition.

14.2.10.1.2 Cold Functional Testing

Cold functional testing is defined as an integrated system operation of various plant systems that can be operated prior to fuel loading. The intent is to observe any unexpected operational problems from either an equipment or a procedural standpoint and to provide an opportunity for further operator familiarization with the system operating procedures under operating conditions.

Some cold functional testing is accomplished during the preoperational test program. For example, integrated and simultaneous operation of .the following systems may take place duirng the flush of the total system: condensate system, condensate demineralizer system, low pressure coolant injection (LPCI) system, core spray systems, reactor water cleanup (RWCU) system, service water systems, turbine building closed cooling water (TBCLCW) system, reactor building closed cooling water (RBCLCW) system, and others. As required, additional integrated system performance will be demonstrated prior to fuel loading.

14.2.10.1.3 Routine Surveillance Testing

Because the interval between completion of a preoperational test on a system and system operation may be of considerable length, a number of routine surveillance tests must be performed prior to fuel loading and must be . repeated on a routine basis. The Technical Specifications (Chapter 16) detail the test frequency. In general, this surveillance test program is instituted prior to fuel loading by the plant operating staff.

14.2.10.1.4 Master Tracking System (MTS)

A detailed list of items that must be completed, including the preoperational tests, work requests, design changes, and proper disposition of all exceptions noted during preoperational testing listed in Table 14.2-1, is rechecked to verify completion prior to the final approvals for fuel loading and for those items required, at each significant

new step such as heatup, opening main steam isolation valves (MSIVs), and turbine generator operation.

14.2.10.1.5 Initial Fuel Loading (Open Vessel Plateau)

Fuel loading requires the movement of the full core complement of assemblies from the fuel pool to the core, with each assembly identified by number before being placed in the correct coordinate position. The procedure controlling this movement is arranged so that operability checks of installed neutron instrumentation are made at predetermined intervals throughout the loading, thus demonstrating reliable monitoring capability to ensure subcriticality is maintained throughout fuel loading. A complete check is made of the fully loaded core to ascertain that all assemblies are properly installed, correctly oriented, and occupying their designated positions.

14.2.10.1.6 Zero Power Level Tests (Open Vessel Plateau)

At this point, a number of tests are conducted that are best described as initial zero power level tests. Chemical and radiochemical tests are made in order to check the quality of the reactor water before and after fuel loading and to establish base and background levels that are required to facilitate later analysis and instrument calibrations. Plant and site radiation surveys are made at specific locations for comparison with the values obtained at the subsequent operating power levels. Shutdown margin verification is made for the fully loaded core. Criticality is achieved with each of the two prescribed rod sequences, during which data are recorded for each rod withdrawn. Each control rod drive (CRD) will have been scrammed during a previous vessel 1,000-lb hydrostatic test with selected drives timed at two intermediate reactor pressures and for different accumulator pressures, and will undergo additional performance testing. The initial setting of the intermediate range monitors (IRMs) is at maximum gain.

14.2.10.2 Initial Heatup to Rated Temperature and Pressure

Heatup follows the satisfactory completion of the fuel loading and zero power level tests (Sections 14.2.10.1.5 and 14.2.10.1.6) and further checks are made of coolant chemistry together with radiation surveys at the selected plant locations. Selected CRDs are scram-timed at rated temperatures and pressures. The process computer checkout continues as more process variables become available for input. The reactor core isolation cooling (RCIC) system will undergo controlled starts at low reactor pressure and

at rated conditions, with testing in the quick-start mode at 1,000 psig. Correlations are obtained between reactor vessel temperatures at several locations and the values of other process variables as heatup continues. The movements of NSSS piping in the drywell, mainly as a function of expansion are recorded for comparison with design data.

14.2.10.3 Power Testing from 25 to 100 Percent of Rated Output

The power test phase comprises the following tests, many of which are repeated several times at the different test levels. While a certain basic order of testing is maintained relative to power ascension, there is, nevertheless, considerable flexibility in the test sequence at a particular power level which may be used whenever it becomes operationally expedient. In no instance, however, is nuclear safety compromised.

1. Coolant chemistry tests and radiation surveys are made at each principal test level to preserve a safe and efficient power increase.

2. Selected CRDs are scram-timed at various power levels to provide correlation with the initial data.

3. The effect of control rod movement on other parameters (e.g., electrical output, steam flow, and neutron flux level) is examined for different power conditions.

4. Following the first reasonably accurate APRM calibration (25 percent power) the IRMs are reset.

5. At each major power level (25, 50, 75 and 100 percent), the local power range monitors (LPRMs) are calibrated.

6. The APRMS are calibrated initially at each new power level and following LPRM calibration.

7. Completion of the process computer checkout is made for all variables, and the various options are compared with independent calculations as soon as significant power levels are available.

9. Collection of data from the system expansion tests is completed for those piping systems that have not previously reached full operating temperatures.

10. The axial and radial power profiles are explored fully by means of the traversing incore probe (TIP) system at representative power levels during the power ascension.

11. Core performance evaluations are made at all test points above the 25-percent power level and for selected flow conditions; the work involves determination of the core thermal power, maximum linear heat generation rate, minimum critical power ration (MCPR), and other thermal parameters.

12. Overall plant stability in relation to minor perturbations is shown by the following group of tests;

    a. Core power-void mode response.

    b. Pressure regulator set point change.

    c. Water level setpoint change.

    d. Bypass valve opening.

    e. Recirculation flow setpoint change.

    For the first of these tests, neutron flux (power) response on LPRM chambers is observed on control rod withdrawal. The next two tests require that the changes made approximate as closely as possible a step change in demand, while for the next test the bypass valve is opened quickly. The remaining test is performed to properly adjust the control loop of the recirculation system. For all of these tests, plant performance is monitored by recording the transient behavior of numerous process variables, the one of principal interest being neutron flux. Other imposed transients are produced by step changes in demand core flow, simulating loss of a feedwater heater and failure of the operating pressure regulator to permit takeover by the backup regulator.

13. The category of major plant transients includes full closure of all MSIVs, fast closure of turbine generator control valves and stop valves, loss of

the main generator and offsite power, tripping of a feedwater pump, and several trips of the recirculation pumps. The plant transient behavior is recorded for each test and the results may be compared with the acceptance criteria and the predicted design performance.

14. A test is made of the main steam safety relief valves in which leaktightness and general operability are demonstrated.

15. The jet pump flow instrumentation is calibrated at 25 and 100% power.

16. The as-built characteristics of the recirculation system are determined as soon as operating conditions permit full core flow.

14.2.11 Test Program Schedule

Preoperational and startup testing is planned to be conducted in accordance with the following schedule. This schedule is based on current information and is updated onsite to consider actual construction and testing progress. It is included to provide general information and sequence but is not considered to be identical to the schedules in use during the startup and test program.

1. The preoperational/acceptance test phase commences in December 1984 and continues until fuel loading in February 1986.

2. The startup test program commences with fuel load and continues through power ascension testing which is completed at the end of the 100-hr warranty run in September 1986.

3. In general, approved preoperational test procedures will be available for NRC review at least 60 days prior to use and startup test procedures at least 60 days prior to fuel load.

14.2.12 Individual Test Descriptions

14.2.12.1 Preoperational Tests

Test abstracts for the preoperational tests are provided in Tables 14.2-2 through 14.2-132. The abstracts identify each test by system; specify the major prerequisites and operating conditions necessary for each (mode of operations of major control systems); provide general test objectives, a summary of the test method, and a summary of the acceptance criteria. Some abstracts may require more than one test depending on variables such as plant status and availability, optimization of resources, and schedule restraints. When additional tests are required they are approved by the JTG, numbered and included on the current Test Index in accordance with the Startup Administrative Procedures.

14.2.12.2 General Discussion of Initial Startup Tests

All tests comprising the initial startup test phase are discussed in Tables 14.2-201 through 14.2-244 and Table 14.2-301. A test objective, test prerequisites, test description, and statement of test acceptance criteria are provided for each test where applicable.

The operating and safety-oriented characteristics of the plant being explored are described in the test objectives.

Where applicable, a definition of the relevant acceptance criteria for the test is given and designated either Level 1 or Level 2. A Level 1 criterion normally relates to the value of a process variable assigned in the design of the plant, component system or associated equipment. If a Level 1 criterion is not satisfied, the plant is placed in a stable condition until resolution is obtained. Tests compatible with this stable condition may be continued. Following resolution, applicable tests are repeated as necessary to verify that the requirements of the Level 1 criterion are now satisfied.

A Level 2 criterion is associated with expectations relating to the performance of systems. If a Level 2 criterion is not satisfied, operating and testing plans would not necessarily be altered. Investigations of the measurements and of the analytical techniques used for the predictions would be started.

For transients involving oscillatory response, the criteria are specified in terms of decay ratio (defined as the ratio

of successive maximum amplitudes of the same polarity). The decay ratio must be less than unity to meet a Level 1 criterion and less than 0.25 to meet Level 2.

During the conduct of the initial startup test phase the technical specifications will be followed.

TABLE 14.2-1

PREOPERATIONAL TEST DESCRIPTIONS

Table Number	System Number	Title
A. Acceptance Tests		
14.2-2		DELETED
14.2-3		DELETED
14.2-4		DELETED
14.2-5		DELETED
14.2-6		DELETED
14.2-7		DELETED
14.2-8		DELETED
14.2-9		DELETED
14.2-10		DELETED
14.2-11		DELETED
14.2-12		DELETED
14.2-13		DELETED
14.2-14		DELETED
14.2-15		DELETED
14.2-16		DELETED
14.2-17		DELETED
14.2-18		DELETED
14.2-19		DELETED
14.2-20		DELETED
14.2-21		DELETED
14.2-22		DELETED
14.2-23		DELETED
14.2-24		DELETED
B. Preoperational Tests		
14.2-25	1	Main and Auxiliary Steam
14.2-26		DELETED
14.2-27	3	Condensate System
14.2-28	4	Condensate Storage and Transfer
14.2-29	5	Condensate Demineralizer and Resin Regenerator
14.2-30	6	Feedwater System
14.2-31	7	Feedwater Control
14.2-32	8	Feedwater Heaters and Extraction Steam System
14.2-33	9	Condenser Air Removal
14.2-34	10A	Circulating Water System
14.2-35		DELETED
14.2-36	11	Service Water

TABLE 14.2-1 (Cont)

Table Number	System Number	Title
14.2-37		DELETED
14.2-38	13	Reactor Building Closed Loop Cooling Water
14.2-39	14	Turbine Building Closed Loop Cooling Water
14.2-40	16	Makeup Water Storage and Transfer
14.2-41	17	Process Sampling System
14.2-42	17	Post-Accident Sample System
14.2-43	19	Instrument and Service Air System
14.2-44	23	EHC System
14.2-45		DELETED
14.2-46	28	Nuclear Boiler Instrumentation
14.2-47	29	Reactor Recirculation System
14.2-48	30	CRD Hydraulics
14.2-49	31	Residual Heat Removal System
14.2-50	32	Low-Pressure Core Spray
14.2-51	33	High-Pressure Core Spray
14.2-52	34	Automatic Depressurization System
14.2-53	35	Reactor Core Isolation Cooling System
14.2-54	36	Standby Liquid Control
14.2-55	37	Reactor Water Cleanup System
14.2-56	38	Fuel Pool Cooling and Cleanup
14.2-57	39	Fuel Handling and Reactor Service Equipment
14.2-58	40	Liquid Radwaste System
14.2-59	41	Solid Radwaste System
14.2-60	42	Off-Gas System
14.2-61	43	Fire Protection Water
14.2-62	44	Foam Fire Protection
14.2-63	45	Fire Protection CO_2
14.2-64	46	Fire Protection Halon
14.2-65	47	Smoke, Flame, and Temperature Detection
14.2-66		DELETED
14.2-67	49	Hot water and Glycol Heating Systems
14.2-68	52	Reactor Building Ventilation-Reactor Building HVAC
14.2-69	53	Control Building Air Conditioning
14.2-70		DELETED
14.2-71	55	Turbine Building Ventilation
14.2-72	56	Radwaste Building Ventilation
14.2-73	57	Diesel Generator HVAC
14.2-74	59A	Electric Tunnel Ventilation System

TABLE 14.2-1 (Cont)

Table Number	System Number	Title
14.2-75	60	Drywell Cooling System
14.2-76	61	Primary Containment Purge
14.2-77	61	Standby Gas Treatment
14.2-78	62	DBA Hydrogen Recombiner
14.2-79	63	Reactor Building Drains
14.2-80	64	Turbine Building Drains
14.2-81	65	Radwaste Building Drains
14.2-82	66	Miscellaneous Drains - Diesel Generator Floor Drains, Auxiliary Service Building, Reactor Building MAT, Condensate Storage Building, and Main Stack Drains Systems
14.2-83		DELETED
14.2-84		DELETED
14.2-85		DELETED
14.2-86	67	Drywell Equipment and Floor Drains
14.2-87		DELETED
14.2-88		DELETED
14.2-89		DELETED
14.2-90		DELETED
14.2-91		DELETED
14.2-92		DELETED
14.2-93		DELETED
14.2-94		DELETED
14.2-95	71	Uninterruptible Power Supply
14.2-96		DELETED
14.2-97		DELETED
14.2-98		DELETED
14.2-99		DELETED
14.2-100	73	Normal DC Distribution (24/48-V DC Power)
14.2-101	74	Emergency DC Distribution
14.2-102	75	Station and Emergency Lighting
14.2-103	76	Plant Communication System
14.2-104	78	Remote Shutdown
14.2-105	79,80A	Area Process, Airborne, and Gaseous Radiation Monitoring System
14.2-106	80B	Main Steam Line Radiation System
14.2-107	81	Containment Leakage Monitoring
14.2-108	82	Containment Atmosphere Monitoring System
14.2-109	83	Primary Containment Isolation
14.2-110	84	Reactor Building Crane (Polar Crane)
14.2-111		DELETED
14.2-112	85	Reactor Coolant and ECCS Leak Detection

TABLE 14.2-1 (Cont)

Table Number	System Number	Title
14.2-113	86	Loose Parts and Vibration Monitoring
14.2-114	88	Containment Inerting System
14.2-115	90	Seismic Monitoring System
14.2-116	91	Process Computer
14.2-117	92	Neutron Monitoring
14.2-118	93	Rod Block Monitoring
14.2-119	94	TIP System
14.2-120	95A	Rod Worth Minimizer
14.2-121	95B	Rod Sequence Control
14.2-122	96	Reactor Manual Control and Control Rod Position Indication
14.2-123	97	Reactor Protection
14.2-124		DELETED
14.2-125	100A	Standby Diesel Generator
14.2-126	100B	HPCS Diesel Generator
14.2-127	100	DELETED
14.2-128	106	Redundant Reactivity Control System
14.2-129		Loss of Power/ECCS Functional
14.2-130		DELETED
14.2-131		Structural Integrity and Integrated Leak Rate Test
14.2-132		Secondary Containment Leak Rate Test

C. Startup Tests

Table Number	Procedure Number	Title
14.2-201	SUT-1	Chemical and Radiochemical
14.2-202	SUT-2	Radiation Measurement
14.2-203	SUT-3	Fuel Loading
14.2-204	SUT-4A	Full Core Shutdown Margin
14.2-205	UT-4B	DELETED
14.2-206	SUT-5	Control Rod Drive System
14.2-207	SUT-6	Source Range Monitor Performance and Rod Control Sequence
14.2-208	SUT-8	Control Rod Sequence Exchange
14.2-209	SUT-10	Intermediate Range Monitor Performance
14.2-210	SUT-11	LPRM Calibration
14.2-211	SUT-12	APRM Calibration
14.2-212	SUT-13	NSSS Process Computer
14.2-213	SUT-14	RCIC System
14.2-214	SUT-16A	Selected Process Temperatures
14.2-215	SUT-16B	Water Level Reference Leg Temperature

TABLE 14.2-1 (Cont)

Table Number	Procedure Number	Title
14.2-216	SUT-17	System Expansion
14.2-217	SUT-18	Core Power Distribution
14.2-218	SUT-19	Core Performance
14.2-219	SUT-20	Steam Production
14.2-220	SUT-21	Core Power-Void Mode
14.2-221	SUT-22	Pressure Regulator
14.2-222		DELETED
14.2-223	SUT-23B	Loss of Feedwater Heating
14.2-224	SUT-23C	Feedwater Pump Trip
14.2-225	SUT-23D	Maximum Feedwater Runout Capability
14.2-226	SUT-24	Turbine Valve Surveillance
14.2-227	SUT-25A	Main Steam Isolation Valves
14.2-228	SUT-25B	Full Reactor Isolation
14.2-229		
14.2-230	SUT-26	Relief Valves
14.2-231	SUT-27	Turbine Trip and Generator Load Rejection
14.2-232	SUT-28	Shutdown from Outside the Main Control Room
14.2-233	SUT-29A	Recirculation Flow Control, Valve Position Control
14.2-234	SUT-29B	Recirculation Flow Loop Control
14.2-235	SUT-30A	Recirculation System One Pump Trip
14.2-236	SUT-30B	Recirculation System Two Pump Trip
14.2-237	SUT-30C	Recirculation System Performance
14.2-238	SUT-30D	Recirculation Pump Runback
14.2-239	SUT-30E	Recirculation System Cavitation
14.2-240	SUT-31	Loss of Turbine Generator and Offsite Power
14.2-241	SUT-33	Drywell Piping Vibration
14.2-242	SUT-35	Recirculation System Flow Calibration
14.2-243	SUT-70	Reactor Water Cleanup System
14.2-244	SUT-71	Residual Heat Removal System
14.2-301	SUT-(later)	Drywell Atmosphere Cooling System
14.2-401		DELETED
14.2-402		DELETED
14.2-403		Qualification of GE Principal Testing Personnel During Startup Testing

TABLE 14.2-25

MAIN AND AUXILIARY STEAM SYSTEM

System 1

Test Objectives

1. To demonstrate the operation of the main and auxiliary steam system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Auxiliary systems needed for this procedure are available for test support.

Test Procedure

1. The test procedure will verify that various components of the main and auxiliary steam system operate within their design requirements.

2. The main steam isolation valves are tested for proper operation.

3. The instrumentation associated with the main steam flow restrictors will be tested.

4. Applicable control instrumentation and interlocks will be verified for proper response.

TABLE 14.2-25 (Cont)

Acceptance Criteria

1. System controls, interlocks, and valves function within their design requirements.

2. The system functions as described in Section 10.3.

TABLE 14.2-27

CONDENSATE SYSTEM

System 3

Test Objectives

1. To demonstrate the operation of the condensate system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Applicable support systems are available for test use.

Test Procedure

1. The test procedure will verify logic and trip modes for the condensate and condensate booster pumps for different system configurations and transient conditions.

2. Annunciators, alarms, control instrumentation, and interlocks will be tested for proper response for each transient.

3. The condensate and condensate booster pump recirculation flow control valves will be verified to open when their associated pumps are running and to close when they are stopped.

TABLE 14.2-27 (Cont)

Acceptance Criteria

1. The condensate and condensate booster pumps operate within their design requirements.

2. The logic and trip modes of the pumps and automatic valves function according to applicable SWEC design drawings.

3. The system functions as described in Section 10.4.7.

TABLE 14.2-28

CONDENSATE STORAGE AND TRANSFER SYSTEM

System 4

Test Objectives

1. To demonstrate the operation of the condensate storage and transfer systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Makeup water storage and transfer system is available to support the test.

Test Procedure

1. The capability of the makeup water storage system to supply water to the condensate storage tanks is verified.

2. Full flow tests of both condensate transfer pumps will be conducted to verify pump operability.

3. Pump autostart and trip features are verified for both pumps.

4. Condenser hotwell level control system is tested for proper operation of makeup and drawoff valves and alarms associated with hotwell level.

TABLE 14.2-28 (Cont)

Acceptance Criteria

1. Condensate transfer pumps auto-start on low discharge header pressure or high pump discharge header flow demand in accordance with Section 9.2.6.

2. The condenser hotwell can be maintained at the normal level automatically by the normal makeup and drawoff valves in accordance with Section 9.2.6.

3. The condensate emergency makeup valve opens automatically on low hotwell level as described in Section 9.2.6.

4. The condensate transfer system is capable of supplying water to the appropriate plant systems as listed in Section 9.2.6.

TABLE 14.2-29

CONDENSATE DEMINERALIZATION AND RESIN REGENERATION

System 5

Test Objectives

1. To demonstrate the operation of the condensate demineralization and resin regeneration systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test procedure will verify the proper operation of automatic resin transfers and automatic regenerations.

2. Proper operation of the ultrasonic resin cleaner will be verified.

3. All applicable system trips, logic, and instrumentation will be verified.

4. The waste recovery system will be tested to verify it can properly collect, treat, and transfer regenerant waste to the liquid radwaste system.

5. Resin transfers that can only be accomplished by remote manual means will be performed to verify proper system operation.

TABLE 14.2-29 (Cont)

6. Sampling will be performed to verify water quality meets design specification.

7. System alarms and annunciators will be verified for proper response in conjunction with the tests performed.

Acceptance Criteria

1. System trips, logic, and instrumentation will operate within design requirements as illustrated in applicable SWEC drawings and vendor instruction manuals.

2. The system operates to properly transfer, regenerate, and ultrasonically clean the condensate demineralizers, as referenced in Section 10.4.6.

3. The waste recovery system operates to properly collect, treat, and transfer regenerant waste, as referenced in Section 10.4.6.

4. System water quality meets specifications, as outlined in Section 10.4.6 and Regulatory Guide 1.56.

TABLE 14.2-30

FEEDWATER SYSTEM

System 6

Test Objectives

1. To the extent practical, demonstrate the operation of the feedwater system and its components.

2. To ensure the feedwater system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers that supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are complete.

4. The main condenser is available as a water source and discharge point for the reactor feed pumps.

5. The condensate system is available to provide a flow path and the required NPSH for the reactor feed pumps.

Test Procedure

1. All remotely operated valves are verified for proper manual and automatic operation.

2. The reactor feed pump auxiliary lubrication oil pumps are verified to operate both manually and in response to automatic signals.

3. Both high and low energy feedwater cycle cleanup control valves are demonstrated to be operable from their remote manual loading stations.

TABLE 14.2-30 (Cont)

4. The reactor feed pump minimum flow recirculation control valves are demonstrated to open and modulate to provide minimum flow for the reactor feed pumps.

5. The reactor feed pump logic and trip modes are demonstrated in various system configurations and transient conditions.

6. Associated annunciators, computer points, alarms, control instrumentation, and interlocks are demonstrated for proper response during the test.

Acceptance Criteria

1. The reactor feed pumps and their various logic modes operate according to specifications outlined in applicable SWEC design drawings.

2. Remotely operated feedwater valves, along with their associated permissives, interlocks, and controls, function according to applicable SWEC design drawings.

3. Auxiliary lubrication oil pumps and their various logic modes operate according to specifications outlined in applicable SWEC design drawings.

4. The feedwater system functions as described in Section 10.4.7.

TABLE 14.2-31

FEEDWATER CONTROL SYSTEM

System 7

Test Objectives

1. To demonstrate to the extent practical the operation of the feedwater control systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. All applicable control equipment and instrumentation calibration has been completed.

Test Procedure

1. Proper operation of the motor driven pump discharge regulating valve will be verified with the pump tripped and with no feedwater flow.

2. Proper system response is verified as simulated signals for reactor level, feedwater flow, and steam flow are injected into the feedwater control system.

3. Verification will be made that feedwater control level and flow indicators, recorders, and computer inputs respond to simulated signals and that associated annunciators function according to the system design.

TABLE 14.2-31 (Cont)

Acceptance Criteria

All applicable system parameters are within requirements as detailed in GE design test specifications.

TABLE 14.2-32

FEEDWATER HEATERS AND EXTRACTION STEAM

System 8

Test Objectives

1. To demonstrate to the extent the practical operation of the feedwater heaters and extraction systems and associated components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The heater drain pump permissives, interlocks, and control instrumentation will be tested.

2. The heater drain pumps will be tested for proper operation.

3. The normal and emergency level control valves along with their control instrumentation will be verified for proper response to signals generated from level sensing devices.

Acceptance Criteria

1. The heater drain pumps and their various logic modes operate within their design requirements outlined in applicable SWEC design drawings.

TABLE 14.2-32 (Cont)

2. The feedwater heater extraction isolation valves along with their associated permissives, interlocks, and control instrumentation function according to applicable SWEC design drawings and specifications.

3. The level control valves and associated instrumentation operate in accordance with applicable SWEC design drawings.

4. The system design functions as described in Section 10.4.10.

TABLE 14.2-33

CONDENSER AIR REMOVAL SYSTEM

System 9

Test Objectives

1. To demonstrate the operation of the condenser air removal system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. All valve lineups are completed.

Test Procedure

1. All applicable controls, interlocks, and valves are checked for proper operation to ensure performance is within system specifications.

2. Vacuum pump trips and automatic system isolations will be tested for proper operation.

3. System instrumentation is tested for proper response to simulated signals or actual parameter variation.

4. System performance is verified to ensure that air is evacuated from the main condenser.

Acceptance Criteria

1. System isolations and vacuum pump trips function in accordance with Section 10.4.2.5.

TABLE 14.2-33 (Cont)

2. The condenser air removal pumps evacuate the condenser to approximately 5 in Hg abs and deliver discharge gases to the main stack at atmospheric pressure.

TABLE 14.2-59 (Cont)

Acceptance Criteria

1. System parameters affecting the processing of solid radwaste meet design requirements.

2. System interlocks, trips, and controls associated with the system function as designed.

3. The solidified product should be a homogeneous mixture with no freestanding water.

TABLE 14.2-60

OFF-GAS SYSTEM

System 42

Test Objectives

1. To demonstrate the operation of the off-gas system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test verifies system controls and interlocks to ensure performance in accordance with specifications.

2. The operation of the off-gas vacuum pumps is verified.

3. The off-gas control panel is tested to ensure all control functions and remote monitoring of the off-gas system are provided.

4. Applicable alarms are verified in conjunction with the tests performed.

Acceptance Criteria

1. Applicable system parameters, i.e., flows, temperatures, and pressures, fall within design requirements.

TABLE 14.2-60 (Cont)

2. System controls and interlocks function in accordance with design requirements.

3. The system functions as described in Section 11.3.2.

TABLE 14.2-34

CIRCULATING WATER SYSTEM

System 10A

Test Objectives

1. To demonstrate the operation of the circulating water system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The service water, instrument air, turbine building closed loop cooling acid treatment, and hypochlorite systems are available as required to support this test.

Test Procedure

1. The cooling tower is operated in its four modes of operation.

2. Applicable annunciators, trip signals, and interlocks are verified for proper operation.

3. The six circulating water pumps and associated equipment are tested to ensure they are capable of delivering water at the required system flows and pressures.

TABLE 14.2-34 (Cont)

Acceptance Criteria

1. The circulating water pumps operate in accordance with applicable SWEC design drawings and specifications.

2. The circulating water screen wash pumps operate as designed in accordance with applicable SWEC design drawings.

3. The cooling towers operate in accordance with applicable SWEC design drawings in all four modes of operation.

TABLE 14.2-36

SERVICE WATER SYSTEM

System 11

Test Objectives

1. To demonstrate the operation of the service water systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The circulating water system is capable of receiving water from this system during this test.

Test Procedure

1. Intake and discharge equipment is tested for normal and reverse flow using appropriate logic controls.

2. All service water pumps are tested for proper operation of automatic starts and trips, flow rates, and appropriate interlocks.

3. All applicable motor- and air-operated valves are operated to verify that they open and close properly.

4. The service water flow path to the spent fuel pool is verified.

5. The system and its associated logic functions for supplying water to the emergency diesels, HPCS diesel, and RBCLC systems are verified.

TABLE 14.2-36 (Cont)

6. The system is run to verify that it can supply appropriate flows to systems that it supports.

7. The capability of the service water system to supply adequate diesel cooling water flows.

Acceptance Criteria

1. The applicable instruments, controls, and interlocks function as shown on the applicable design drawings.

2. Each service water pump and associated discharge strainer will provide its rated flow for all normal and emergency operating conditions.

3. The intake and discharge structures and associated gates and valves function as designed. The intake and discharge structures will supply and discharge lake water in accordance with Table 9.2-8.

4. Under normal operating conditions, the service water system supplies lake water to the components listed in Table 9.2-2 at the specified flow rates to meet the power generation design objectives of Section 9.2.1.1.2.

5. During a LOCA condition with a loss of offsite power or low service water pressure, the service water system will supply lake water to the components listed in Table 9.2-1 at the specified flow rates to meet the safety design objectives of Section 9.2.1.1.1.

TABLE 14.2-38

REACTOR BUILDING CLOSED LOOP
COOLING WATER SYSTEM

System 13

Test Objectives

1. To demonstrate the operation of the reactor building closed loop cooling water system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. Applicable preliminary tests are completed and the system turned over to NMPC.

2. Applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The service water, instrument air, and makeup water transfer systems are available to support testing.

Test Procedure

1. All applicable controls, interlocks, and valves are checked for proper operation and performance in accordance with design requirements.

2. The autostart and trip features of the RBCLC main and booster pumps will be verified.

3. The system temperature control valves are modulated to verify proper operation.

4. The expansion tank level control valve operation is verified.

TABLE 14.2-38 (Cont)

5. Motor-operated isolation valves will be verified.

Acceptance Criteria

1. All applicable controls, interlocks, and trips function as designed.
2. The autostart and trip features of the RBCLC main and booster pumps function in accordance with Section 9.2.2.5.
3. The expansion tank level control valve maintains level in accordance with Section 9.2.2.

TABLE 14.2-39

TURBINE BUILDING CLOSED LOOP COOLING WATER SYSTEM

System 14

Test Objectives

1. To demonstrate the operation of the turbine building closed loop cooling water system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The instrument air, service water, and makeup water transfer systems are available to support this test.

5. The TBCLCW system is operating in a two-pump, two-heat exchanger mode with the third pump and heat exchanger vented and in standby.

Test Procedure

1. System controls and interlocks are verified for the three system pumps in the various modes of operation.

2. System surge and makeup tank level is monitored and verified for proper operation.

3. System control valves are modulated to verify proper operation.

TABLE 14.2-39 (Cont)

4. The automatic response for the off-gas condenser outlet valves is checked for proper response.

5. With the TBCLCW system in a two-pump mode, the baseline operating data is collected and recorded.

Acceptance Criteria

1. The automatic trip and start features for the TBCLCW pumps operate according to Section 9.2.7.

2. Temperature control valves operate in accordance with Section 9.2.7.

3. The system supplies water to the required plant components in accordance with Table 9.2-9.

4. In a two-pump mode, the TBCLCW system is capable of meeting the maximum design flow rate (16,000 gpm) in accordance with Section 9.2.7.

TABLE 14.2-40

MAKEUP WATER TRANSFER AND STORAGE SYSTEM

System 16

Test Objectives

1. To demonstrate the operation of the makeup water transfer and storage system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Water treatment system is available to support this test.

Test Procedure

1. All controls, interlocks, and valves are verified for proper operation to ensure performance with system specifications.

2. Applicable set points are verified.

3. Pump autostart, trip features, and associated alarms and annunciators will be verified for proper operation by varying several parameters including: tank level, pump suction and discharge pressure, and system flow.

TABLE 14.2-40 (Cont)

Acceptance Criteria

1. Each transfer pump will deliver at least 200 gpm in accordance with Equipment Specification No. NMP2-P222W.

2. The system functions as described in Section 9.2.3.

TABLE 14.2-41

PROCESS SAMPLING SYSTEM

System 17

Test Objectives

1. To demonstrate the operation of the turbine, reactor, and radwaste buildings sampling systems and components.

2. To ensure the systems are properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The turbine and reactor building closed loop cooling systems are available to support testing.

Test Procedure

1. The test procedure verifies proper system instrumentation response by simulated signals or actual parameter variation.

2. All applicable controls, interlocks, and valves are verified for proper operation to ensure performance within system specifications.

3. All applicable alarms and annunciators are verified for proper operation in conjunction with the tests performed.

TABLE 14.2-41 (Cont)

Acceptance Criteria

1. All air-operated sample system isolation valves operate correctly from their respective sample panels.

2. All applicable system instrumentation, interlocks, and trips function as designed in accordance with Section 9.3.2.

3. The system functions as described in Section 9.3.2.

TABLE 14.2-42

POST-ACCIDENT SAMPLE SYSTEM

System 17

Test Objectives

1. To demonstrate to the extent practical the operation of the post-accident sample system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The sample line solenoid valves are verified for proper operation.

2. The sample line solenoid valve permissive switch is verified for proper operation.

3. The control logic of the sample panel is verified.

4. Where required simulated signals are used to verify that valves respond properly and sample panel functions according to design.

5. Heat tracing operation will be verified.

Acceptance Criteria

1. All applicable system parameters meet design specifications in accordance with GE design specifications.

TABLE 14.2-42 (Cont)

2. The system meets its design functions by delivering representative samples at the designated sample points.

TABLE 14.2-43

SERVICE AND INSTRUMENT AIR SYSTEM

System 19

Test Objectives

1. To demonstrate the operation of the service and instrument air systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test procedure will verify that the instrument and service air system is capable of supplying the plant's compressed air requirements during normal operation.

2. The autostart feature of the compressors will be verified.

3. The air compressor trip modes will be verified for various transients, simulated during testing.

4. Air compressor capacity and load time will be verified.

5. The test will ensure that the instrument air dryers and associated instrumentation operate according to design.

6. System controls and interlocks will be verified for correct response.

TABLE 14.2-43 (Cont)

7. A loss-of-air-supply test (Regulatory Guide 1.68.3) will be conducted on those portions of the instrument air system which interface with safety-related systems to verify that the air-controlled components supplied directly from the instrument air system will respond as designed. A listing of all air- and nitrogen-operated safety-related valves is in Table 14.2-43A. This testing may be performed in the individual system preoperational tests.

8. The test procedure will verify there are no crossties between the service air and instrument air systems which will degrade system operation.

9. Alarms and annunciators will be verified for proper response in conjunction with the various tests performed.

Acceptance Criteria

1. The air compressors operate within design requirements as outlined in Equipment Specification No. NMP2-P261C.

2. The trip and autostart modes for the air compressors function as outlined in applicable SWEC design drawings.

3. Applicable system controls and interlocks operate as specified in applicable SWEC design drawings.

4. The system functions as described in Section 9.3.1.

5. The air- and nitrogen-operated safety-related valves listed in Table 14.2-43A fail in their fail-safe positions on a loss of air/nitrogen.

TABLE 14.2-44

ELECTROHYDRAULIC CONTROL (EHC) SYSTEM

System 23

Test Objectives

1. To demonstrate the operation of the turbine electrohydraulic control system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The hydraulic control subsystem is verified to ensure that hydraulic fluid is supplied at appropriate pressure to control operating and trip devices for turbine stop valves, control valves, bypass valves, and CIVs.

2. Control switches, appropriate alarms, and annunciators are verified for proper operation.

3. Remote-operated valves with appropriate interlocks and set points are verified.

4. The electro-control subsystem is tested to verify that simulated control signals, generated hydraulically, modulate turbine control valves to control turbine generator speed, load, and reactor pressure.

5. System alarms and annunciators are verified.

TABLE 14.2-44 (Cont)

Acceptance Criteria

1. The hydraulic fluid pumps and associated equipment operate in acordance with system design drawings.

2. The system functions as designed in accordance with Section 10.2.2.

3. All applicable alarms and annunciators function as designed.

4. Turbine control valves, bypass valves, and combined intermediate valves respond correctly to simulated signals related to turbine speed, load, and reactor pressure.

TABLE 14.2-46

NUCLEAR BOILER INSTRUMENTATION

System 28

Test Objectives

1. To demonstrate to the extent practical the operation of the nuclear boiler instrumentation system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. Reactor water level instruments shall be verified over the full range for response to actual reactor vessel water level changes and, where practical, the level instruments should be checked against known physical levels in the vessel.

2. All applicable alarms and annunciators will be verified for proper operation in conjunction with the tests performed.

Acceptance Criteria

1. Instruments provide proper control room indication of the parameter being measured.

2. Applicable interlocks and trips function as designed.

TABLE 14.2-46 (Cont)

THE INFORMATION ON THIS PAGE HAS BEEN DELETED.

TABLE 14.2-47

REACTOR RECIRCULATION SYSTEM

System 29

Test Objectives

1. To demonstrate to the extent practical the operation of the reactor recirculation system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. All applicable water quality standards should be met and maintained throughout testing.

Test Procedure

1. The test will verify proper operability of the reactor recirculation system during slow speed pump conditions under normal and transient operating conditions.

2. Motor-operated and flow control valves, along with their corresponding controls and instrumentation, will be verified for proper response.

3. The recirculation pumps will demonstrate required hydraulic performance at different reactor conditions and flow control valve settings.

TABLE 14.2-47 (Cont)

4. Proper operation of the hydraulic power units and their associated equipment will be verified.

Acceptance Criteria

1. All applicable parameters, i.e., flows, temperatures, and pressures, fall within system design requirements as stated in the GE Design Specification.

2. All applicable interlocks and trips function as designed.

TABLE 14.2-48

CONTROL ROD DRIVE HYDRAULIC SYSTEM

System 30

Test objectives

1. To demonstrate the operation of the control rod drive hydraulic system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The reactor manual control and rod position indication system is available to support this test.

5. The CRD vessel internals have been installed.

Test Procedure

1. The test will verify proper operation of sensors, recording devices, and other controls.

2. Valve operability will be confirmed.

3. All pumps and filters will be tested to confirm performance in accordance with design specifications.

4. The capacity of the system to deliver a sufficient steady water supply through normal and alternate routes will be verified.

TABLE 14.2-48 (Cont)

5. Each HCU, CRD, and any applicable annunciators will be verified for proper functioning using normal insert/withdrawal modes and by scram testing.

Acceptance Criteria

1. The applicable parameters, i.e., response times, flows, temperatures, and pressures, are within their design requirements as detailed in GE design specifications.

2. The applicable interlocks and trips function in accordance with the design documents.

TABLE 14.2-49

RESIDUAL HEAT REMOVAL SYSTEM

System 31

Test Objectives

1. To demonstrate to the extent practical the operation of the residual heat removal system and components in all modes except steam condensing.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. The suppression pool suction strainer is 50-percent hooded.

4. Valve lineups are completed.

Test Procedure

1. All applicable valves, sensors, and logic are verified.

2. Water leg pumps are checked to verify their ability to pressurize the RHR system piping.

3. Tests of each RHR operation mode (low pressure coolant injection, containment spray cooling, shutdown cooling, suppression pool cooling) are performed to demonstrate satisfactory operability.

4. Air-flow tests will be conducted using test paths that overlap the water-flow test paths of the pumps to verify that there is no blockage in the containment spray flow paths.

TABLE 14.2-49 (Cont)

Acceptance Criteria

1. System parameters are within the design requirements detailed in the GE Design Specifications.

2. System interlocks and trip functions operate in accordance with applicable design requirements.

TABLE 14.2-50

LOW-PRESSURE CORE SPRAY SYSTEM

System 32

Test Objectives

1. To demonstrate the operation of the low-pressure core spray system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The suppression pool suction strainer is 50-percent hooded.

Test Procedure

1. Proper operation of motor and air-operated valves will be verified.

2. System logic will be tested to verify its proper performance.

3. Operation of the core spray pump and motor assembly will be verified.

4. Flow and hydraulic characteristics of the system will be determined.

5. The system's capability of performing its intended function under emergency conditions upon automatic initiation will be demonstrated.

TABLE 14.2-50 (Cont)

6. The operability of the water leg pump, including its ability to pressurize the LPCS system piping, will be verified.

<u>Acceptance Criteria</u>

1. System parameters fall within design requirements detailed in GE design specifications.

2. System interlocks and trips function as specified in applicable design drawings.

TABLE 14.2-51

HIGH-PRESSURE CORE SPRAY SYSTEM

System 33

Test Objectives

1. To demonstrate the operation of the high-pressure core spray system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. All applicable sensors, pressure switches, gauges, instruments, and protective relays have been calibrated.

4. The suppression pool suction strainer is 50-percent hooded.

5. Valve lineups are complete.

Test Procedure

1. Proper operation of motor- and air-operated valves will be verified.

2. System logic will be tested to verify proper operation.

3. Pump and motor operation is verified.

4. System performance characteristics are obtained and verified to meet design requirements.

5. System initiation on low water level and high drywell pressure is checked to verify ability of system pump to

TABLE 14.2-51 (Cont)

start, the injection valve to open, and the system's ability to deliver rated flow to the vessel in the required time interval.

6. The operability of the water leg pump, including the ability of the pump to pressurize the HPCS system piping, will be verified.

Acceptance Criteria

1. System parameters fall within design requirements as detailed in GE design specifications.

2. System interlocks and trips function as specified in applicable design documents.

TABLE 14.2-52

AUTOMATIC DEPRESSURIZATION SYSTEM

System 34

Test Objectives

1. To demonstrate the operation of the automatic depressurization system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow all NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Instrument and service air, ADS N_2 system, RPS, and nuclear boiler instrumentation systems are available to support testing.

Test Procedure

1. The test verifies controls, interlocks, and valves for proper operation.

2. Nitrogen supply is verified along with the volume of the tanks that their capacity is adequate to meet the stroke requirements of valves.

3. ADS air compressor and dryers are checked to verify that pressurized air can be provided to the valves' pneumatic actuators.

4. ADS logic is verified including auto initiation signals, time delay relay and reset functions, core spray and RHR permissives.

TABLE 14.2-52 (Cont)

5. The operation of the safety relief valves in the relief (pneumatic) mode is verified.

6. The reactor vessel overpressure penetration logic of the ADS system is verified.

7. The safety relief valve solenoid valves will be verified to open when the solenoid coil is energized.

8. ADS accumulator leak rates will be measured to verify that the ADS safety relief valves remain operable if their source of air or nitrogen is lost.

Acceptance Criteria

1. The system logic operates per SWEC logic drawings and GE design specifications.

2. Accumulator capacity meets design requirements per GE design specifications.

3. ADS accumulator leak rates are within design requirements in accordance with GE design specifications.

4. The safety relief valves operate properly in the relief (pneumatic) mode.

5. The accumulators for the ADS relief valves maintain pressure for at least the relief cycle after a loss of nitrogen supply.

TABLE 14.2-53

REACTOR CORE ISOLATION COOLING SYSTEM

System 35

Test Objectives

1. To demonstrate to the extent practical the operation of the reactor core isolation cooling system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The suppression pool suction strainer is 50-percent hooded.

Test Procedure

1. Proper operation of air- and motor-operated valves will be verified.

2. The system sensors and interlocks will be verified to control logic circuitry.

3. The flow controller adjustments and calibrations will be verified.

4. The various flow paths for the system will be verified.

TABLE 14.2-53 (Cont)

Acceptance Criteria

System parameters fall within the design requirements detailed in GE design specifications.

TABLE 14.2-54

STANDBY LIQUID CONTROL SYSTEM

System 36

Test Objectives 21

1. To demonstrate the operation of the standby liquid control system and components. 21

2. To ensure the system is properly designed and constructed.

Safety Precaution 21

Follow NMPC safety rules and proper procedures during testing. 21

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC. 21

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are complete. 21

4. The system is filled with demineralized water.

5. Sufficient quantities of reactor grade boric acid and borax are available at the storage tank location when required to support neutron absorber mixing and loading. 21

Test Procedure

1. Valve, sensor, heat tracing, and logic tests are performed to verify proper operation.

2. The performance of applicable system pumps, motors, instrumentation, motor-operated outlet valves, check globe valves, and relief valves is verified.

3. A system injection test, using demineralized water, is performed prior to fuel loading with the reactor vessel at atmospheric or hydro-pressure, firing one of the squib valves while observing all of the components operate properly.

TABLE 14.2-54 (Cont)

4. Neutron absorber is prepared, analyses performed, and demineralized water introduced into the system according to specifications.

Acceptance Criteria

1. System parameters fall within the design requirements detailed in GE design specifications.

2. The system functions as described in Section 15.8.

TABLE 14.2-55

REACTOR WATER CLEANUP SYSTEM

System 37

Test Objectives

1. To demonstrate the operation of the reactor water cleanup system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow all NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The various system flow paths will be verified.

2. The proper functioning of interlocks and instrumentation is verified.

3. The test will verify isolation and cleanup pump trip logic under transient conditions.

4. Performance of all valves, heat exchangers, and various operating sequences of the filter/demineralizer will be verified.

5. Alarms and communicators will be verified for proper operation in conjunction with the tests performed.

TABLE 14.2-55 (Cont)

Acceptance Criteria

System parameters fall within design requirements detailed in GE design specifications.

TABLE 14.2-56

FUEL POOL COOLING AND CLEANUP

System 38

Test Objectives

1. To demonstrate the operation of the fuel pool cooling and cleanup system.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Electrical lineups are completed.

5. The static head pressure test of the reactor head cavity, fuel pool, and reactor internals storage pools has been completed satisfactorily verifying the integrity of sectionalizing devices, drains, and gasket leak tests.

Test Procedure

1. The test verifies that the system is capable of maintaining, during normal and abnormal conditions, design flow and water chemistry requirements. 21

2. Anti-siphon devices will be verified.

3. Filter online, on-hold, backwash, and precoat functions will be verified.

TABLE 14.2-56 (Cont)

4. System backups from RHR and service water will be verified.

5. Applicable system controls, instrumentation, and interlocks will be verified for correct response.

6. Alarms and annunciators are verified for proper response in conjunction with the tests performed.

Acceptance Criteria

1. Autotrips for SFP cooling pumps functions according to applicable SWEC logic diagrams.

2. Filter operation and sequencing function according to Delaval Manual Inst. 16.550-5000A.

3. System functions as described in Section 9.1.3.

TABLE 14.2-57

FUEL HANDLING AND REACTOR SERVICE EQUIPMENT SYSTEM

System 39

Test Objectives

1. To demonstrate the operation of the fuel handling and reactor service equipment system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Dynamic testing using a dummy fuel bundle and static load tests at 125 percent of that load will be performed on the refueling grapple and platform auxiliary hoists.

Test Procedure

1. All applicable interlocks and logic associated with the refueling platform and service platform are verified.

2. The refueling equipment is checked for proper operation and installation.

3. The in-vessel servicing equipment, such as peripheral orifice servicing, control rod assembly servicing, instrument servicing, and in-vessel fuel assembly servicing, is checked for correct assembly and operation.

4. The reactor vessel servicing equipment is checked for proper assembly and operation.

TABLE 14.2-57 (Cont)

5. The fuel service equipment is checked for proper installation and operation.

6. The servicing aids are checked for proper assembly and operation.

7. The under reactor vessel servicing equipment, including control rod drive servicing equipment and in-core instrumentation servicing equipment, is tested for correct installation and operation.

Acceptance Criteria

System parameters fall within the design requirements detailed in GE test specifications and manuals.

TABLE 14.2-58

LIQUID RADWASTE SYSTEM

System 40

Test Objectives

1. To demonstrate the operation of the liquid radwaste system (LWS) and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The LWS program is checked to verify that it controls the mechanical process sequence.

2. All applicable interlocks, alarms, set points, and annunciators are verified.

3. The test verifies alarms associated with LWS chemistry, in conjunction with the tests performed.

4. The test verifies the auxiliary steam supply is adequately controlled to maintain and operate the necessary equipment.

5. The radwaste computer functions are verified.

6. Radiation detector and monitor control functions will be verified.

TABLE 14.2-58 (Cont)

Acceptance Criteria

1. All applicable interlocks and trips function according to SWEC and manufacturer design drawings.

2. The liquid radwaste system collects, monitors, and processes liquid waste as described in Section 11.2.

3. Radiation detection device support functions and associated alarms and trips function according to SWEC logic drawings.

4. The radwaste computer performs within the design requirements outlined in Specification C062V.

TABLE 14.2-59

SOLID RADWASTE HANDLING SYSTEM

System 41

Test Objectives

1. To demonstrate the operation of the solid radwaste handling system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The WSS program is verified to ensure it controls mechanical process sequence.

2. Applicable system valves, interlocks, and controls are verified.

3. The capability of the system to transfer waste to and from desired destinations is verified using simulated waste variation.

4. The steam supply from the WSS electric boiler is verified.

5. Using a simulated waste stream, waste will be processed via the extruder evaporator to ensure proper mixing and no freestanding water.

TABLE 14.2-59 (Cont)

Acceptance Criteria

1. System parameters affecting the processing of solid radwaste meet design requirements.

2. System interlocks, trips, and controls associated with the system function as designed.

3. The solidified product should be a homogeneous mixture with no freestanding water.

TABLE 14.2-60

OFF-GAS SYSTEM

System 42

Test Objectives

1. To demonstrate the operation of the off-gas system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test verifies system controls and interlocks to ensure performance in accordance with specifications.

2. The operation of the off-gas vacuum pumps is verified.

3. The off-gas control panel is tested to ensure all control functions and remote monitoring of the off-gas system are provided.

4. Applicable alarms are verified in conjunction with the tests performed.

Acceptance Criteria

1. Applicable system parameters, i.e., flows, temperatures, and pressures, fall within design requirements.

TABLE 14.2-60 (Cont)

2. System controls and interlocks function in accordance with design requirements.

3. The system functions as described in Section 11.3.2.

TABLE 14.2-61

FIRE PROTECTION (WATER) SYSTEM

System 43

Test Objectives

1. To demonstrate the operation of the fire protection (water) system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test will verify the operation of the electric and diesel fire pumps and the pressure maintenance pumps for all modes of operation.

2. The high-low level switches and their associated instrumentation for the pressure maintenance pump supply tank will be tested for proper response.

3. Motor-operated deluge valves, including those in the transformer zone, will be tested for automatic operation.

4. The remote-manual operation of these valves from associated fire panels will be verified.

TABLE 14.2-61 (Cont)

5. All motor-operated pre-action valves will be tested for automatic operation in conjunction with a fire detector trip.

6. Corresponding annunciators, alarms, control instrumentation, and system interlocks will be tested for proper response in conjunction with the various tests conducted.

Acceptance Criteria

1. The electric and diesel fire pumps operate according to applicable SWEC design drawings.

2. Motor-operated deluge and pre-action valves function according to applicable SWEC design drawings.

3. System pressure can be maintained between 125 and 135 psig by the fire jockey pumps.

4. The system functions as described in Section 9.5.1.

TABLE 14.2-62

FOAM FIRE PROTECTION SYSTEM

System 44

Test Objectives

1. To demonstrate the operation of the foam fire protection system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The foam concentrate tanks are filled to ≤ half normal level.

Test Procedure

1. The test verifies system controls, interlocks, and valves for proper operation to ensure performance is within specifications.

2. The test will verify the auto start and trip features of the foam pumps and the actuation of automatic valves upon receipt of a signal from the fire detection system or a control switch.

3. Corresponding computer alarms and annunciators associated with the foam fire protection system will be tested for proper response in conjunction with the various tests performed.

TABLE 14.2-62 (Cont)

Acceptance Criteria

1. The auto start and trip features of fixed hazard foam pumps and hose reel foam function in accordance with SWEC design drawings.

2. Automatic valves function in accordance with SWEC design drawings.

3. Foam concentrate utilized is acceptable per NFPA requirements.

TABLE 14.2-63

FIRE PROTECTION CO_2

System 45

Test Objectives

1. To demonstrate the operation of the fire protection CO_2 system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation.

3. Valve lineups are completed.

4. The fire computer, fire detection, and ventilation systems are available to support testing.

Test Procedure

1. The CO_2 storage tanks are filled.

2. The CO_2 hose reels are verified for proper operation.

3. The CO_2 hazard valves are puff tested, with the CO_2 zone piping isolated and its bypass open, from the local fire panel, main fire panel, and associated detection zones in both manual and automatic modes of operation. Concentration tests are performed on total flooding systems.

4. The generator hydrogen and CO_2 subsystems are tested for CO_2 flow.

TABLE 14.2-63 (Cont)

5. Alarms and annunciators are verified for proper response in conjunction with the various tests performed.

Acceptance Criteria

1. Applicable valves and controls operate according to SWEC design drawings.
2. The generator hydrogen and CO_2 valves function according to SWEC design drawings.
3. CO_2 concentrations for total flooding systems are in accordance with NFPA Codes - Volume I, Code 12: Carbon Dioxide Systems.
4. System design and operation is as described in Section 9.5.1.

TABLE 14.2-64

FIRE PROTECTION (HALON) SYSTEM

System 46

Test Objectives

1. To demonstrate the operation of the fire protection (Halon) system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. All auxiliary systems needed for this procedure are operable and available for test use.

Test Procedure

1. The test will verify proper operation of the Halon fire protection system for various operating conditions.

2. The autostart/stop modes of the Halon fire protection system upon a detector trip will be verified.

3. For each fire zone the test verifies that the proper concentration of Halon is reached in a specified time period.

4. Manual operation of the Halon system will be verified from corresponding control panels.

TABLE 14.2-64 (Cont)

5. Corresponding alarms, annunciators, and computer points
21 will be verified for proper response in conjunction with the various tests conducted.

Acceptance Criteria

1. The Halon 1301 system functions as designed and provides
21 the required concentration as specified in the National Fire Codes.

2. System interlocks and trips function in accordance with
21 applicable SWEC design drawings.

3. The system functions as described in Section 9.5.1.

TABLE 14.2-65

SMOKE, FLAME, AND TEMPERATURE DETECTION

System 47

Test Objectives

1. To demonstrate the operation of the smoke, flame, and temperature system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test will verify that the fire detection system is capable of interacting with the fire protection systems in accordance to station specifications. 2

2. The automatic functions of the local fire panels for each zone will be verified for a detector trip.

3. The manual remote functions of the local fire panels will be verified.

4. Corresponding annunciations, alarms, and computer points will be verified in conjunction with the various tests conducted.

5. The supervision modes for the various components of the fire detection system will be verified.

TABLE 14.2-65 (Cont)

Acceptance Criteria

1. Fire detectors and associated instrumentation function according to design criteria as documented in associated vendor diagrams, CMEB Section 9.5-1, and NFPA Codes and Standards.

2. The automatic functions of the local fire panels perform in accordance with applicable SWEC design drawings.

3. The supervision modes operate according to applicable SWEC design drawings.

TABLE 14.2-67

HOT WATER AND GLYCOL HEATING SYSTEMS

System 49

Test Objectives

1. To demonstrate the operation of the hot water and glycol heating systems and components.

2. To ensure the systems are properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. Applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test procedure will verify that the reactor building, turbine building, and radwaste building glycol heating systems operate according to design specifications.

2. Mechanical equipment such as the glycol heating pumps and valves will be tested to demonstrate proper performance.

TABLE 14.2-67 (Cont)

4. The test ensures applicable controls, interlocks, and valves are checked for proper operation.

5. Annunciators and computer alarms are verified in conjunction with the tests performed.

Acceptance Criteria

1. All annunciators, control instrumentation, interlocks, and the various logic modes for the system function as illustrated in design drawings.

2. System flows and pressures are within design limits for all modes of operation.

3. The system meets its design functions as described in Sections 9.4.11 and 9.4.12.

TABLE 14.2-68

REACTOR BUILDING HVAC

System 52

Test Objectives

1. To demonstrate the operation of the reactor building systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. Controls, interlocks, and trips for dampers, fans, unit heaters, and coolers are verified.

2. The emergency recirculation ventilation is tested to verify that cooling is provided during LOCA conditions.

TABLE 14.2-68 (Cont)

3. The reactor head exhaust ventilation system is tested to ensure that air from beneath the vessel head is exhausted.

Acceptance Criteria

1. The building pressures meet design specifications.

2. The system parameters meet design requirements as described in Section 9.4.2.

TABLE 14.2-69

CONTROL BUILDING AIR CONDITIONING

System 53

Test Objectives

To demonstrate the operation of the control building air conditioning system.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests have been completed and the system turned over to NMPC.

2. Applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Applicable lineups have been completed.

Test Procedure

1. The test verifies system controls and interlocks.

2. The system will be started and test data taken to verify performance is within design specifications.

Acceptance Criterion

All applicable system trips, interlocks, and control functions operate in accordance with applicable SWEC drawings.

TABLE 14.2-71

TURBINE BUILDING HVAC SYSTEM

System 55

Test Objectives

1. To demonstrate the operation of the turbine building HVAC system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. The glycol heating system is available to support testing.

Test Procedure

1. The elevator machine room ventilation fans and their interlocks with the inlet and outlet dampers are verified for proper operation.

2. The main stack substructure ventilation fans and exhaust dampers and associated interlocks are verified.

3. The turbine building main ventilation exhaust and supply fans and dampers are verified for proper operation.

4. The turbine building ventilation system's capability to maintain a negative pressure inside the turbine building is verified.

TABLE 14.2-71 (Cont)

Acceptance Criteria

1. The turbine building HVAC system can, under normal building and operating conditions, maintain the turbine building at a slightly negative pressure in accordance with Section 9.4.4.

2. The turbine building supply fans, exhaust fans, dampers, and their associated interlocks function in accordance with SWEC design drawings.

3. System parameters fall within design requirements, as described in Section 9.4.4.

TABLE 14.2-72

RADWASTE BUILDING VENTILATION

System 56

Test Objectives

1. To demonstrate the operation of the radwaste building ventilation system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. An in-place DOP penetration test per Regulatory Guide 1.140 has been performed on the HEPA filters to confirm a satisfactory particulate removal efficiency.

Test Procedure

1. The test verifies system controls, interlocks, and fans are checked for proper operation in accordance with specifications.

2. The equipment exhaust subsystem fans and filter trains are verified.

3. Corresponding alarms and annunciators are verified for proper response in conjunction with various tests conducted.

4. All ductwork under positive pressure will be tested in accordance with procedures of the Associated Air Balance Council.

TABLE 14.2-72 (Cont)

Acceptance Criteria

1. System controls, trips, and interlocks function according to SWEC design drawings.

2. Environmental conditions are maintained within design limits according to Table 9.4-1.

3. System air flows are balanced in a way to maintain building pressures within design requirements in accordance with Table 9.4-1.

TABLE 14.2-73

DIESEL GENERATOR BUILDING HVAC SYSTEM

System 57

Test Objectives

1. To demonstrate the operation of the diesel generator building HVAC system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The remote manual controls for all fans, heaters, and dampers are verified.

2. The controls for the makeup air subsystem fan, damper, and heater are verified.

3. The controls of the normal supply subsystem fans and associated interlocks and dampers are verified.

4. The automatic and manual controls of the standby subsystem fans and associated interlocks and dampers are verified.

Acceptance Criteria

1. Temperature is controlled within the requirements of Table 9.4-1.

TABLE 14.2-73 (Cont)

2. The system parameters meet design requirements as described in Section 9.4.6.

TABLE 14.2-74

ELECTRIC TUNNELS
VENTILATION SYSTEM

System 59A

Test Objectives

1. To demonstrate the operation of the electric tunnel ventilation system.

2. To ensure that the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve and damper lineups are completed.

Test Procedure

1. Interlock and control functions of fans and dampers will be verified.

TABLE 14.2-74 (Cont)

Acceptance Criteria

1. All protective functions operate in accordance with applicable SWEC documents.

2. System parameters fall within design requirements in accordance with applicable SWEC documents.

TABLE 14.2-75

DRYWELL COOLING SYSTEM

System 60

Test Objectives

1. To demonstrate the operation of the drywell cooling system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Reactor building closed loop cooling system is available to support this test.

Test Procedure

1. The test will verify that the drywell unit coolers are capable of performing within design specifications.

2. Temperature sensors, system controls, and interlocks will be verified.

3. The system logic will be verified.

4. Alarms and annunciators are verified for response in conjunction with various tests performed.

TABLE 14.2-75 (Cont)

Acceptance Criteria

1. The system parameters meet design requirements, as described in Section 9.4.2.

2. System controls operate in accordance with applicable SWEC design drawings.

TABLE 14.2-76

PRIMARY CONTAINMENT PURGE SYSTEM

System 61

Test Objectives

1. To demonstrate the operation of the primary containment purge system and components.
2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.
2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.
3. Valve lineups are completed.
4. The drywell must be able to be closed.
5. The reactor building ventilation and standby gas treatment systems are available to support this test.

Test Procedure

1. The purge fan and its associated valves are verified.
2. System isolation controls and responses are verified.
3. Corresponding annunciators and computer alarms are verified in conjunction with various tests.

TABLE 14.2-76 (Cont)

Acceptance Criteria

1. The system parameters meet design requirements as described in Section 9.4.2.

2. System controls and interlocks function to isolate in accordance with applicable SWEC design drawings.

TABLE 14.2-77

STANDBY GAS TREATMENT SYSTEM

System 61

Test Objectives

1. To demonstrate the operation of the standby gas treatment system and components.

2. To verify that the standby gas treatment system can maintain the proper reactor building pressure.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Reactor building ventilation system is available, and all reactor building doors and hatches can be closed.

Test Procedure

1. The test procedure will verify that the two gas treatment filter trains operate according to design specifications under normal and transient conditions.

2. System auto initiations will be verified.

3. System controls and interlocks will be verified.

4. Standby gas treatment fan operation will be verified.

TABLE 14.2-77 (Cont)

5. The test will verify that the standby gas treatment system will accomplish its design objective of establishing the reactor building pressure equal to or below -0.25 in WG within the required time interval.

Acceptance Criteria

1. Applicable interlocks and controls function in accordance with applicable design drawings.

2. Reactor building ventilation system isolation features operate in accordance with applicable design drawings.

3. Each standby gas treatment system train can maintain reactor building pressure equal to or below -0.25 in W.G. (see Section 6.5).

4. The secondary containment drawdown time to -0.25 in W.G. is less than 90 sec, at a maximum of 3,600 cfm (see Technical Specification Section 3/4.6.5).

TABLE 14.2-78

DBA HYDROGEN RECOMBINER SYSTEM

System 62

Test Objectives

1. To demonstrate the operation of the DBA hydrogen recombiner system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The recombiner unit logic and trips will be verified.

2. Sensors and associated instrumentation will be verified.

3. Corresponding alarms will be verified in conjunction with various tests performed.

4. The operation of solenoid and motor-operated valves will be verified.

TABLE 14.2-78 (Cont)

Acceptance Criteria

1. The hydrogen recombiner units function in accordance with applicable SWEC design drawings.

2. System remote-controlled valves operate as described in applicable SWEC design drawings.

3. The hydrogen recombiner unit blowers function to deliver design flow rates within the requirements of Equipment Specification No. NMP2-P282K.

TABLE 14.2-79

REACTOR BUILDING DRAINS

System 63

Test Objectives

1. To demonstrate the operation of the reactor building drain systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Makeup water storage or another clean water system is available to support testing.

Test Procedure

1. Demineralized water will be used for testing the equipment drain tanks and service water or fire protection water will be used for testing of the floor drain sumps.

2. The capacity of all of the reactor building floor drain sumps will be verified and compared to sump design volumes.

3. The auto start/stop and lead/lag features of the applicable system pumps are verified.

TABLE 14.2-79 (Cont)

4. The ability of the system to transfer collected water to the liquid radwaste system will be verified.

Acceptance Criteria

1. Pump auto and sequencing controls operate in accordance with the applicable SWEC design drawings.

2. The system is capable of transferring collected liquids to the liquid radwaste system.

TABLE 14.2-80

TURBINE BUILDING DRAINS

System 64

Test Objectives

1. To demonstrate the operation of the turbine building drains system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system is turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. An appropriate clean water system is available to support testing.

Test Procedure

1. Clean water will be used to supply water for testing.

2. The autostart/autostop features of the sump pumps will be verified.

3. The test will verify the ability of the system to collect and process water to the liquid radwaste system.

4. Corresponding annunciators and alarms are verified in conjunction with the various tests performed.

5. The capacity of the sumps is verified and compared to sump design volumes.

TABLE 14.2-80 (Cont)

Acceptance Criteria

1. Pump auto and sequencing controls operate in accordance with applicable SWEC design drawings.

2. The system is capable of transferring collected liquids to the liquid radwaste system.

TABLE 14.2-81

RADWASTE BUILDING DRAINS

System 65

Test Objectives

1. To demonstrate the operation of the radwaste building drains system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. A clean water system is available to support testing.

Test Procedure

1. Clean water will be used to supply water for testing.

2. The autostart/stop features of the sump pumps will be verified.

3. The test will verify the ability of the system to collect and process water to the liquid radwaste system.

4. Corresponding annunciators and alarms are verified in conjunction with the various tests.

5. The capacities of the sumps are verified and compared to sump design volumes.

TABLE 14.2-81 (Cont)

Acceptance Criteria

1. Pump auto and sequencing controls operate in accordance with the applicable SWEC design drawings.

2. The system is capable of transferring collected liquids to the liquid radwaste system.

TABLE 14.2-82

MISCELLANEOUS DRAINS -
DIESEL GENERATOR BUILDING FLOOR DRAINS,
AUXILIARY SERVICE BUILDING,
REACTOR BUILDING MAT, CONDENSATE
STORAGE BUILDING, AND
MAIN STACK DRAIN SYSTEM

System 66

Test Objectives

1. To demonstrate the operation of the various miscellaneous drain systems and their components.

2. To ensure the systems are properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are satisfactorily completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. A clean water source is available to supply water for this test.

Test Procedure

1. The oil holding compartment is filled.

2. The diesel generator oil separator is verified so that it can handle flow from the three sumps and applicable monitors respond in accordance with design requirements.

3. The ability of the drain systems to transfer water for further processing and/or disposal will be verified.

4. Sump capacities are verified.

TABLE 14.2-82 (Cont)

4. Sump capacities are verified.

5. System automatic controls and associated alarm functions are verified.

Acceptance Criteria

1. The oil holding compartment will hold approximately 300 gallons of oil in accordance with Purchase Specification No. NMP2-W014S.

2. The oil separator 2DFM-SP1 can handle hydraulic fluid flow from all three sumps individually, and applicable monitors respond as designed.

3. Level switches function in accordance with applicable LSKs.

4. The diesel generator building drain system meets its design requirements in accordance with Section 9.3.3.

5. Sump capacities meet applicable design specifications.

6. System controls function in accordance with applicable design drawings.

TABLE 14.2-86

DRYWELL FLOOR AND EQUIPMENT DRAIN SYSTEM

System 67

Test Objectives

1. To demonstrate the operation of the drywell floor and equipment drain system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. All auxiliary systems needed for this test are available for support.

Test Procedure

1. The test will verify that the drywell equipment and floor drains operate within system design specifications.

2. The auto controls and associated alarm functions for the floor and equipment drain pumps will be verified.

3. Operation of remote-controlled equipment will be verified.

4. The ability of the system to transfer water for further processing and/or disposal will be verified.

5. Sump capacities will be verified.

TABLE 14.2-86 (Cont)

Acceptance Criteria

1. The system functions as described in Section 9.3.3.

2. Sump capacities meet design specifications.

3. System automatic controls function as designed.

TABLE 14.2-95

UNINTERRUPTIBLE POWER SUPPLY

System 71

Test Objectives

1. To demonstrate the operation of the uninterruptible power supply system (UPS) and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

3. All auxiliary systems needed for the preoperational test are available for use.

Test Procedure

1. The test procedure will demonstrate that the UPS performs as designed using normal and alternate ac supplies.

2. Proper voltage regulation of the UPS will be verified.

3. The ability of the UPS to carry and transfer full load will be demonstrated (from the UPS to the alternate ac source and vice versa automatically and manually).

4. The UPS will be tested to verify its capability to carry load on battery power.

5. Simulating an inverter loss, the static switch will be tested to show that it can transfer load to the alternate ac source without loss of load.

TABLE 14.2-95 (Cont)

6. Alarms and control instrumentation will be verified for proper operation in conjunction with the various tests conducted.

Acceptance Criteria

1. The UPS performs its intended function using both normal and alternate power supplies.

2. The system functions as described in Section 8.3.1.

TABLE 14.2-100

NORMAL DC SYSTEMS (24/48V)

System 73

Test Objectives

1. To demonstate the operation of the 24/48-V dc systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

1. Follow NMPC safety rules and proper procedures during testing.

2. Protective apron, gloves, and face shield shall be worn when measuring specific gravities.

3. Fresh water should be available in case acid is splashed on skin or eyes.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

3. Control building ventilation or portable ventilation is available to exhaust the battery rooms.

Test Procedure

1. A load bank system will be used to establish desired loads during discharge test.

2. The test verifies that the batteries will function as designed by conducting a capacity test.

3. The battery chargers will be tested to demonstrate their ability to recharge the batteries with steady-state load connected.

TABLE 14.2-100 (Cont)

Acceptance Criteria

1. Each battery set will demonstrate a capacity greater than that required for a 4-hr discharge at design load, as evidenced by the battery capacity, corrected to 77°F, equal to or greater than 90 percent of the manufacturer's rating at the 4-hr rate.

2. Batteries 3A, 3B, 3C, and 3D can be fully recharged in a 24-hr period from minimum charge condition, utilizing the battery chargers with the calculated steady-state load connected in accordance with Section 8.3.2.

3. Undervoltage alarms to PGCC will alarm with loss of voltage in accordance with Section 8.3.2.1.3.

TABLE 14.2-101

EMERGENCY DC SYSTEMS

System 74

Test Objectives

1. To demonstrate the operation of the emergency dc systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

1. Follow NMPC safety rules and proper procedures during testing.

2. Protective apron, gloves, and face shield shall be worn when measuring specific gravities.

3. Fresh water shall be available in case acid is splashed on skin or eyes.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Control building ventilation or portable ventilation is available to exhaust the battery rooms.

Test Procedure

1. A load bank system and/or normal dc system will be used to establish desired loads during discharge test, as available.

2. The batteries will be subjected to a 2-hr service test discharge in accordance with a precalculated load profile.

3. The battery chargers will be tested to demonstrate their ability to recharge the batteries with a simulated

TABLE 14.2-101 (Cont)

steady-state load connected from their minimum charge state.

4. The batteries will be subjected to a capacity test.

5. With the batteries in a low voltage condition, as defined by technical specifications, the test will verify that the voltage applied to designated Class 1E loads is within the required operating range for that equipment. This verification will be performed on equipment that has been identified by an engineering review as potential voltage-drop problem cases.

Acceptance Criteria

1. Each battery will demonstrate a capacity equal to or greater than that required during the 2-hr service discharge test evidenced by the terminal voltage remaining above 105-V in accordance with Section 8.3.2.

2. Each battery charger is capable of supplying the combined demands of steady state loads while recharging its associated battery to a full-charge condition within 24 hr from the minimum charge state.

3. Ground detection indication and annunciation for Batteries 2A, 2B, and 2C function as designed.

4. Dc bus undervoltage relays and associated alarms function as designed.

5. Battery capacities are ≥90 percent of the manufacturer's rated capacity.

TABLE 14.2-102

STATION EMERGENCY LIGHTING SYSTEM

System 75

Test Objectives

1. To demonstrate the operation of the station and emergency lighting system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable distribution panels to supply electric power are available.

Test Procedure

1. The emergency lighting system is verified to provide adequate illumination in areas required for operating safety-related equipment during emergency conditions.

2. The essential lighting system is checked to ensure adequate illumination is provided for certain critical areas of the station such as the control room.

3. The egress lighting system is verified to provide adequate illumination for all egress signs and egress routes.

TABLE 14.2-102 (Cont)

Acceptance Criteria

1. All station emergency lighting systems will be shown to provide adequate lighting in accordance with Table 9.5-2.

2. The system functions as described in Section 9.5.3.

TABLE 14.2-103

PLANT COMMUNICATION SYSTEM

System 76

Test Objectives

1. To demonstrate the operation of the plant communication systems and components.

2. To ensure the system is properly designed and constructed.

3. To verify that the plant communication systems can provide proper intraplant and plant-to-offsite communications.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system is turned over to NMPC.

2. All applicable distribution panels to supply electric power are available.

Test Procedure

1. The test will verify the proper operation of the plant page party/public address communication system.

2. The system's emergency evacuation alarm and other emergency alarms will be verified.

3. The test will verify that plant communication systems provide communications indoors, outdoors, and off-site.

4. Verification of power supplies for communication equipment will be performed.

Acceptance Criteria

1. The system's emergency evacuation alarm and other emergency alarms function and provide audible alarm signals throughout the plant.

TABLE 14.2-103 (Cont)

2. The intraplant and plant-to-offsite communications operate as designed.

3. The plant communication systems function in accordance with Section 9.5.2.

TABLE 14.2-104

REMOTE SHUTDOWN

System 78

Test Objectives

1. To demonstrate the operation of remote shutdown system.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. All support systems needed for this preoperational test are available for test use.

Test Procedure

1. The test procedure will verify that the remote shutdown system is capable of properly operating the required shutdown systems and their components.

2. System interlocks, controls, and instrumentation will be verified for proper response.

3. It will be demonstrated that no systems can be operated from the remote shutdown panel unless the specific transfer switch is placed in the emergency position.

4. Control functions transferred to the remote shutdown panel from the normal control panel in the control room can only be operated from the remote shutdown panel.

5. All applicable alarms will be verified for proper operation in conjunction with various tests performed. 21

TABLE 14.2-104 (Cont)

Acceptance Criteria

1. The remote shutdown system transfer switches override controls from the main control room and transfer controls to the remote shutdown panel.

2. All shutdown panel control switches demonstrate proper control over appropriate equipment.

3. All shutdown panel instrumentation functions as designed.

4. The system functions as described in Section 7.4.1.4.

TABLE 14.2-105

AREA, PROCESS AIRBORNE, AND GASEOUS
RADIATION MONITORING SYSTEMS

Systems 79, 80A

Test Objectives

1. To demonstrate the operations of the digital and nondigital radiation monitoring systems and components.

2. To ensure the systems are properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the systems are turned over to the NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

3. Valve lineups are completed.

4. Calibration of detectors and monitors using specific samples and/or sources has been completed.

Test Procedure

1. Annunciators, alarms, and trip functions for the digital radiation monitoring and nondigital radiation monitoring systems are verified to ensure that monitors provide warning of increasing radiation levels, power failures, or component malfunctions.

2. Alarms, set points, and indicators are verified by simulated signals or parameter variation (samples or sources).

3. System isolations which are initiated by the process radiation monitoring system will be demonstrated in those systems' applicable preoperational tests.

TABLE 14.2-105 (Cont)

Acceptance Criteria

1. The process radiation systems provide continuous indication of selected radiation levels.

2. Alarms function on increasing radiation levels.

3. All automatic actions initiated by the process radiation monitoring systems function as designed.

4. The systems function as described in Section 11.5.

TABLE 14.2-106

MAIN STEAM LINE RADIATION MONITORING SYSTEM

System 80B

Test Objectives

1. To demonstrate the operation of the main steam line radiation monitoring system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system is turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

Test Procedure

1. System alarms, detectors, indicators, and annunciators are checked to ensure they detect and measure gamma radiation levels at the main steam lines.

2. Alarms and set points are initiated to verify that the system provides indication and annunciation in the main control room of main steam line radiation levels.

TABLE 14.2-106 (Cont)

Acceptance Criteria

1. The system functions as designed in accordance with Section 11.5.2.2.1.

2. All applicable alarms and annunciators function as designed.

TABLE 14.2-107

CONTAINMENT LEAKAGE MONITORING

System 81

Test Objectives

1. To demonstrate the operation of the containment leakage monitoring system and components.

2. To ensure the systems are properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable distribution panels to supply electric power to control circuits and instrumentation are available.

3. No primary containment isolation signals present.

Test Procedure

1. The drywell and suppression chamber manometer isolation valves are tested.

2. All drywell electrical penetrations are pressure tested.

3. Associated annunciators and computer alarms will be verified by simulated signals or actual parameter variation in conjunction with tests performed.

Acceptance Criteria

1. Each leakage monitoring valve must be operable from the individual switches and isolated in pairs from their respective isolation switches. Proper valve and off normal status display indication function as required in accordance with the LSKs.

TABLE 14.2-107 (Cont)

2. The isolation valves must isolate on a containment isolation signal. The isolation valves must provide proper computer response as to their respective positions in accordance with applicable SWEC design drawings.

3. All electrical penetrations must maintain pressure and associate annunciators and computer alarms function when a low pressure condition exists.

TABLE 14.2-108

CONTAINMENT ATMOSPHERE MONITORING

System 82

Test Objectives

1. To demonstrate the operation of the containment atmosphere monitoring systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test procedure will ensure that the containment monitoring system will provide indication of atmospheric conditions in the drywell and suppression chamber.

2. Hydrogen, oxygen, and humidity analyzers; drywell radiation monitors, suppression pool water level elements, and drywell and suppression pool temperature and pressure elements will be checked for proper operation.

3. Alarms, annunciators, control instrumentation, and interlocks will be tested for correct response for each test condition.

4. The test will simulate abnormal operating conditions to test the isolation features of the system.

Table 14.2-108 (Cont)

Acceptance Criteria

1. The containment monitoring system measures the containment atmospheric conditions and provides the information to the main control room.

2. Control room instrumentation responds correctly to parameter variations.

3. All applicable alarms and annunciators function in accordance with Section 6.2.1.7.

TABLE 14.2-109

PRIMARY CONTAINMENT ISOLATION SYSTEM
(NSSS)

System 83

Test Objectives

1. To demonstrate the operation of the primary containment isolation system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test procedure ensures that the system automatically isolates appropriate lines penetrating the primary containment when predetermined plant limits are reached.

2. The drywell-to-suppression pool and containment vacuum breakers will be verified for proper operation.

3. All applicahble set points, alarms, and annunciators related to this system will be tested in conjunction with tests performed.

Acceptance Criteria

1. The system functions in accordance with Section 6.2.4.

TABLE 14.2-109 (Cont)

2. All primary containment isolation functions operate in accordance with applicable design drawings.

TABLE 14.2-110

REACTOR BUILDING - POLAR CRANE

System 84

Test Objectives

1. To demonstrate the operation of the reactor building - polar crane and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Dynamic and static load tests, at 100 percent and 125 percent of rated load, have been performed satisfactorily.

Test Procedure

1. All pendant and radio controls are verified for proper operation.

2. The operation of all locking and safety devices is verified.

3. The restrictive path operation is verified.

4. Nondestructive and functional testing of the special lifting devices for reactor vessel internals will be performed.

Acceptance Criteria

1. All limit switches, interlocks, and locking and safety devices function as designed.

TABLE 14.2-110 (Cont)

2. The polar crane responds correctly to all pendant and remote control functions.

3. The testing of the special lifting devices has been satisfactorily completed in accordance with ANSI N14.6-1978.

TABLE 14.2-112

REACTOR COOLANT AND ECCS LEAK DETECTION SYSTEM

System 85

Test Objectives

1. To demonstrate the operation of the reactor coolant and ECCS leak detection system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Alarm set points are set according to design requirements.

Test Procedure

Valve, sensor, and logic tests are performed to determine proper operation on the following systems:

1. Area leak detection systems and equipment.

2. Leak detection for drywell floor and equipment drain sumps.

3. Drywell coolers condensate monitoring.

4. Leak detection for reactor building equipment and floor drain sumps.

5. Flow leak detection for RWCU system.

6. Safety system for RCIC turbine exhaust.

TABLE 14.2-112 (Cont)

7. Head seal leak detection.

8. Drywell and reactor vessel head vent line leak detection.

9. Drywell air cooler temperature monitoring.

10. Main steam line relief and safety valve leakoff.

11. RCIC and main steam line high flow detection and RCIC low pressure detection.

12. RHR/RCIC steam line high flow detection.

13. Fission products monitoring subsystem.

Acceptance Criteria

All applicable system parameters are within the design requirements, as detailed in GE design specifications.

TABLE 14.2-113

LOOSE PARTS MONITORING AND
VIBRATION MONITORING SYSTEM

System 86

Test Objectives

1. To demonstrate the system's ability to monitor structural stability of the reactor vessel internal components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

Test Procedure

1. The RPV will be drained to allow a complete vessel internal inspection.

2. The loose parts monitoring system will be tested to ensure proper response to induced vibration signals.

Acceptance Criteria

All design parameters are within design limits in accordance with GE design specifications.

TABLE 14.2-113 (Cont)

THE INFORMATION ON THIS PAGE HAS BEEN DELETED.

TABLE 14.2-114

CONTAINMENT INERTING SYSTEM

System 88

Test Objectives

1. To demonstrate the operation of the containment inerting system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test procedure ensures system controls, interlocks, and valves are verified for proper operation.

2. Alarms and instrumentation are verified in conjunction with tests performed.

3. The test procedure will verify the system's ability to inert the containment and maintain the oxygen concentration at or below 4 percent.

Acceptance Criteria

1. All applicable parameters are within design specifications.

2. Applicable interlocks, controls, and remote-operated equipment operate in accordance with design.

TABLE 14.2-114 (Cont)

3. The system is capable of supplying nitrogen gas for inerting the primary containment when required and maintaining an inert atmosphere in the containment during normal operations in accordance with Section 9.3.

TABLE 14.2-115

SEISMIC MONITORING SYSTEM

System 90

Test Objectives

1. To demonstrate the operation of the seismic monitoring system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

Test Procedure

1. The test verifies proper operation of the system and instrumentation and alarms.

2. The test verifies the seismic monitoring system's ability to monitor and record seismic motion.

Acceptance Criteria

1. All applicable alarms and annunciators function as designed.

2. The system detects, records, and provides immediate information for seismic events at the plant site.

3. The system functions as described in Section 3.7.4A.

TABLE 14.2-115 (Cont)

THE INFORMATION ON THIS PAGE HAS BEEN DELETED.

TABLE 14.2-116

PROCESS COMPUTER

System 91

Test Objectives

1. To demonstrate the operation of the process computer and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power are available.

Test Procedure

1. The test will verify that the process computer can properly process analog input signals from various sensors, initiate annunciators when transients occur, and generate a printout of system parameters of the monitored event.

2. The test will verify that all sensors or signal device digital input signals initiate annunciators and generate printouts of monitored events.

3. The test will verify proper operation of system features provided for display/printout of plant parameters.

4. The test will verify by use of test cases proper operation of nuclear steam supply system calculations and balance of plant performance calculations.

Acceptance Criteria

The system and all applicable parameters function in accordance with design specifications.

TABLE 14.2-117

NEUTRON MONITORING

System 92

Test Objective

1. To demonstrate the operation of the neutron monitoring systems and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

Test Procedure

Verification of the neutron monitoring system capability will be demonstrated by the proper integrated operation of the following:

1. SRM and IRM detectors and their respective insert and retract mechanisms and cables.

2. SRM and IRM channels, including recorders, trip logic, bypass logic, system interlocks, power supplies, and annunciators.

3. All LPRM detectors and their respective input signals to corresponding APRMs.

4. All APRM channels, including trips, bypasses, recorders, interlocks, and annunciators.

5. Recirculation flow bias signals input to the neutron monitoring system.

TABLE 14.2-117 (Cont)

Acceptance Criteria

All applicable parameters are within design specifications in accordance with GE design specifications.

TABLE 14.2-118

ROD BLOCK MONITORING

System 93

Test Objectives

1. To demonstrate the operation of the rod block monitoring system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

Test Procedure

1. The test will verify that each LPRM input signal for a selected control rod will be displayed in the correct meter group.

2. Verification will be made for the various trip modes using simulated. signals for different operating conditions.

3. The test will verify independent Bus A and B power supplies to corresponding RBM channels.

4. All associated annunciators, recorders, control instrumentation, and system interlocks will be tested for proper operation according to design specifications for the RBM system.

Acceptance Criteria

All applicable system parameters are within design specifications in accordance with GE design specifications.

TABLE 14.2-118 (Cont)

THE INFORMATION ON THIS PAGE HAS BEEN DELETED

TABLE 14.2-119

TRAVERSING INCORE PROBE SYSTEM

System 94

Test Objectives

1. To demonstrate the operation of the traversing incore probe system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Drive mechanism and indexer purge system is operating.

4. Flux probing monitors are calibrated and amplifiers have correct setting.

Test Procedure

1. Cross calibration interlocks are verified.

2. All shear valve monitor lamps function correctly and squib current is monitored accurately.

3. The manual operation mode is verified.

4. The automatic operation mode is verified.

5. The manual override is checked for proper operation.

6. The automatic stop is checked for proper operation.

TABLE 14.2-119 (Cont)

7. The automatic detector withdrawal is verified on containment isolation, loss of 125 V dc, or loss of the shear valve monitor signal.

8. The containment secure lamp circuits are checked for correct operation.

9. The manual scan, manual ball valve, and low speed control operations are verified.

Acceptance Criteria

All applicable parameters are within design specifications in accordance with GE design specifications.

TABLE 14.2-120

ROD WORTH MINIMIZER SYSTEM

System 95A

Test Objectives

1. To demonstrate the operation of the rod worth minimizer system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

3. All auxiliary systems required for the test will be available for test use.

Test Procedure

1. The test will verify for power ascension and normal operating modes, the ability for the RWM to restrict, monitor, and initiate error signals for rod movement and selection.

2. Proper operation will be verified for all computer inputs, associated annunciators, control instrumentation, and system interlocks of the RWM system.

Acceptance Criteria

The system parameters are within design specifications in accordance with GE design specifications.

TABLE 14.2-120 (Cont)

THE INFORMATION ON THIS PAGE HAS BEEN DELETED.

TABLE 14.2-121

ROD SEQUENCE CONTROL SYSTEM

System 95B

Test Objectives

1. To demonstrate the operation of the rod sequence control system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

3. The rod position indication system, reactor manual control system (RMCS), and the CRD system are available to support this test.

Test Procedure

1. The logic for each RSCS status and resultant displays, annunciators, and set points is verified.

2. The performance of the rod pattern controller is verified.

3. Supply of continuously updated rod position data from the rod position indication system to the RSCS is verified.

4. Provision for single rod bypass is checked.

5. Rod sequences are verified with respective control rod group assignments.

6. Constraints of rod movement are verified.

TABLE 14.2-121 (Cont)

Acceptance Criteria

All applicable parameters are within design specifications in accordance with GE design specifications.

TABLE 14.2-122

REACTOR MANUAL CONTROL AND ROD POSITION INDICATION

System 96

Test Objectives

1. To demonstrate the operation of the reactor manual control and rod position indication system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

3. The cooling fans in the control room panel for rod display are operable.

Test Procedure

1. All rod blocks, alarms, and interlocks for all modes of the reactor mode switch are verified.

2. A test simulator will supply rod position information to verify the proper operation of the displays and alarms associated with the RPIs.

3. The rod drift alarm is tested for proper operation.

4. All control modes are utilized to verify the proper functioning of the manual control system, the proper energization sequence, and the proper timing of the CRD directional control valves and stabilizing valves.

TABLE 14.2-122 (Cont)

Acceptance Criteria

All applicable parameters are within design specifications in accordance with GE design specifications.

TABLE 14.2-123

REACTOR PROTECTION SYSTEM

System 97

Test Objectives

1. To demonstrate the operation of the reactor protection system and components.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. The following control rod drive hydraulic system components are installed and available: backup scram valves, scram pilot valves, the discharge volume isolation pilot valves, the scram valves, and discharge header drain and vent valves, and scram valve position lights.

4. The RPS power supplies (UPSs and MG sets) and the electrical protection circuitry are available.

5. RPS motor-generator set performance and full load testing is completed.

Test Procedure

1. All valve, sensor, and logic tests are performed to demonstrate system operability.

2. The sensor to actuator relay test is performed to verify system interconnections and proper actuation of relay logic associated with system sensors.

TABLE 14.2-123 (Cont)

3. Response time testing will be performed for all RPS equipment required to be tested by the Technical Specifications and will be measured from the process sensor through the final actuating device.

4. The mode switch is checked in each of its modes of operation to verify that all functions are operating properly.

5. The scram trip system is tested to demonstrate its operability.

6. Associated annunciator and computer alarms are checked for proper response in conjunction with the tests performed.

7. The trip system power independence and fail-safe feature is verified.

Acceptance Criteria

1. All applicable parameters are within design specifications in accordance with GE design specifications.

2. Response times shall be within parameters specified in technical specifications.

Nine Mile Point Unit 2 FSAR

TABLE 14.2-125

STANDBY DIESEL GENERATORS

System 100A

Test Objectives

1. To demonstrate the operation of the standby diesel generators and supporting fuel and starting air system.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Service water system is available to support testing.

5. No. 2 diesel fuel oil is available from the diesel oil change tanks.

Test Procedure

1. The air compressors are checked to verify that they deliver air at design pressure to the air receivers, and all controls are tested to verify that air receiver pressure is maintained within design limits.

2. The engine-driven and motor-driven circulating water pumps are verified to function as designed and verified that the jacket water system can maintain engine temperature within design limits.

3. The diesel generator lubrication oil system is tested to demonstrate its ability to deliver lubrication oil to required engine components and maintain the oil temperature within design limits.

TABLE 14.2-125 (Cont)

4. The test will demonstrate proper operation of the diesel generators during loading, including a complete loss of load, with verification of voltage requirements and overspeed limits.

5. The ability to synchronize the diesel generator, while under load, with offsite power sources will be demonstrated.

6. Applicable alarms and annunciators will be verified for proper operation in conjunction with the various tests performed.

7. Full load-carrying capability will be demonstrated during a 24-hr test run, 22 hr of which will be at the load equivalent of the continuous rating and 2 hr at the 2-hr rating of the diesel generator.

8. The manual and automatic features for each standby diesel generator fuel oil transfer pump are tested for proper operation.

<u>Acceptance Criteria</u>

1. Each diesel generator starts, accelerates to rated speed, voltage, and frequency, and is ready for loading sequence within 10 sec of receipt of the start signal.

2. Diesel generator voltage requirements are maintained, and overspeed limits are not exceeded during a complete loss of load.

3. With the generator connected to the emergency or equivalent larger load, it can be synchronized and the load transferred to the offsite power source.

4. The engine jacket water system functions to maintain engine temperatures within design limits in both standby and operating conditions.

5. The diesel generator lubrication oil system functions to lubricate engine bearings and other moving parts with the generator in operation and maintains oil temperature within design limits when engine is in a standby condition.

TABLE 14.2-125 (Cont)

6. The diesel generator fuel oil transfer pumps start automatically when a day tank low level occurs and stop automatically when a day tank high level occurs.

7. Each air compressor is capable of recharging the air receivers from minimum to maximum operating pressure in 45 min or less.

8. The starting air supply is capable of starting the diesel generators five times from maximum operating pressure without recharging.

9. The diesel generators can maintain full rated load at normal operating voltage and frequency without exceeding any operational limits.

10. The diesel generators can maintain operating voltage and frequency during an overload condition equivalent to its 2-hr rating for 2 hr.

TABLE 14.2-126

HPCS DIESEL GENERATOR

System 100B

Test Objectives

1. To demonstrate the operation of the HPCS diesel generator and supporting fuel and starting oil systems.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the system turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are completed.

4. Service water system is available to support testing.

5. No. 2 fuel oil is available from the diesel oil storage tanks.

Test Procedure

1. The air compressors are checked to verify that they deliver air at design pressure to the air receivers and all controls are tested to verify that air receiver pressure is maintained within design limits.

2. The engine jacket water system is verified to function as designed and verified that it maintains engine temperature within design limits.

3. The HPCS diesel generator lubrication oil systems will be tested to verify their ability to supply oil to necessary engine components and maintain the engine in a warm prelubricated standby condition.

TABLE 14.2-126 (Cont)

4. The test will demonstrate the operation of the diesel generator during loading, including complete loss of load, with verification of voltage requirements and overspeed limits.

5. The ability to synchronize the generator, while under load, with offsite power sources will be demonstrated.

6. The test will demonstrate proper operation of the diesel generator under full rated load and overload conditions.

7. All applicable alarms and annunciators will be verified for proper operation in conjunction with the tests performed.

8. The manual and automatic features for each standby diesel generator fuel oil transfer pump are tested for proper operation.

<u>Acceptance Criteria</u>

1. The HPCS diesel generator starts, accelerates to rated speed, voltage, and frequency within 13 sec of receipt of a start signal.

2. Diesel generator voltage requirements are maintained, and overspeed limits are not exceeded during a complete loss of load.

3. With the generator connected to the emergency or equivalent load, it can be synchronized and load transferred to the offsite power source.

4. The engine jacket water system functions as designed to maintain engine temperature within design limits in both standby and operating conditions.

5. The diesel generator lubrication oil system functions to lubricate engine bearings and other moving parts and maintain the engine in a warm prelubricated standby condition.

6. The diesel generator fuel oil transfer pumps start automatically when a day tank low level occurs and stop automatically when a day tank high level occurs.

TABLE 14.2-126 (Cont)

7. Each air compressor is capable of recharging the receivers from minimum to maximum operating pressure in 30 min or less.

8. The starting air supply is capable of starting the diesel generators five times from maximum operating pressure without recharging.

9. The diesel generator can maintain full rated load at normal operating voltage and frequency without exceeding any operational limits.

10. The diesel generator can maintain operating voltage and frequency during an overload condition equivalent to its 2-hr rating for 2 hr.

TABLE 14.2-128

REDUNDANT REACTIVITY CONTROL SYSTEM

System 106

Test Objectives

1. To demonstrate the operation of the redundant reactivity control system (RRCS), its components, and interconnecting systems that perform the RRCS function.

2. To ensure the system is properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed for the RRCS and all interconnecting systems, i.e., control rod drive, reactor recirculation, feedwater, standby liquid control, nuclear boiler, RWCU, and neutron monitoring.

2. The system is turned over to NMPC.

3. Applicable portions of interconnecting systems are available for testing, as needed.

Test Procedure

1. The test procedures ensures that all components, controls, logic, and interlocks are checked for proper operation.

2. All applicable alarms are verified in conjunction with the tests performed.

3. All automatic signals and actuations are verified by simulated signal or actual parameter variation.

4. All system interfaces and interactions are verified.

Acceptance Criteria

1. All applicable interlocks and trips function as designed.

TABLE 14.2-129 (Cont)

2. All automatic actuations function as designed.
3. The system functions as described in Section 15.8.

TABLE 14.2-129

LOSS OF POWER/ECCS FUNCTIONAL TEST

Test Objectives

1. To demonstrate the onsite electrical distribution systems in conjunction with the GCCS system during simulated emergency.

2. To ensure the systems are properly designed and constructed.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests of the electrical distribution system are complete and the system turned over to NMPC.

2. Valve lineups are completed.

3. The following systems must be available in a normal operational mode to support testing: service water, diesel generators, diesel generator HVAC, RHR, RCIC, HPCS, LPCS, process computer, control building HVAC, RPS, reactor recirculation, reactor building HVAC, standby gas treatment, and their preoperational tests complete.

Test Procedure

1. The test will demonstrate proper Power System response to a loss of the 115 Kv Distribution System, independently and simultaneously, both with and without LOCA/containment isolation signals.

2. The test will verify that there is no voltage present at selected nonenergized buses.

3. Redundancy and independence of the emergency distribution systems will be demonstrated by simulating losses of redundant divisions and verifying the correct operation of the operable division and nonoperation of the deenergized buses/equipment.

TABLE 14.2-129 (Cont)

4. The test will verify the capability of the diesel generators to:

   a. Start and assume the design loads for a LOCA/containment isolation and/or loss of offsite power in the specific sequential loading times.

   b. Maintain voltage and frequency during loading.

   c. Reject the largest single load any time after the design loading sequence is complete.

5. The test will verify that the emergency loads can operate with the minimum and maximum design ac voltages available.

6. Temperature rise on all large power transformers will be verified under maximum available load.*

7. Voltage drops will be verified between load centers and MCCs at maximum available load* and extrapolated to rated load conditions.

8. Voltage drops between MCCs and selected motor loads, representative of the most severe set of load and cable sizes and cable length, will be verified to be within acceptable limits.

9. The test will demonstrate that the normal AC Power System can provide sufficient power to start, accelerate and run the ECCS and selected normal plant loads during simulated LOCA conditions.

Acceptance Criteria

1. Systems required to operate during LOCA and/or loss of offsite power conditions operate within time and load requirements of their design in accordance with Section 8.3.

2. In the event one diesel generator becomes unavailable, the remaining two diesels will be capable of feeding the loads necessary for safe plant shutdown in accordance with Section 8.3.

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*Maximum loads available inplant not exceeding the rating of the equipment.

TABLE 14.2-129 (Cont)

3. The failure of any one electrical division does not affect the operation of the others or their LOCA/containment isolation functions.

4. The diesel generators can start and assume their LOCA/containment isolation and/or loss of power loads in the specified times and sequence while maintaining voltage and frequency within specified limits, from both cold (normal standby) and hot (operating) temperatures.

5. On a loss of the largest single load the diesel generator does not overspeed or exceed 75 percent of the overspeed setting, whichever is greater.

6. The design emergency loads can start and run properly under minimum and maximum ac voltage conditions.

7. The temperatures on the large power transformers do not exceed the transformer's maximum rated temperature while carrying maximum available load.

8. Voltage drops from load centers to MCCs and MCCs to motor loads shall be within design requirements.

9. The ECCS loads can be started, accelerated and run while being supplied from normal offsite or standby AC Power Systems.

TABLE 14.2-131

STRUCTURAL INTEGRITY
INTEGRATED LEAK RATE TEST

Test Objectives

1. To verify the overall structural integrity of the primary containment.

2. To determine primary containment leakage rates with the containment at test pressure.

Safety Precaution

Follow NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are completed and the primary containment turned over to NMPC.

2. All applicable motor control centers to supply electric power to control circuits and instrumentation are available.

3. Valve lineups are completed.

Test Procedure

1. The test verifies the primary containment integrity by pressurizing it to test pressure and conducting integrated leak rate measurements on the primary containment.

2. The primary containment leakage monitoring system will be used to monitor containment pressure during the test.

Acceptance Criteria

1. All leak rates from penetrations, valves, and overall containment are demonstrated to be within design limits.

2. Test pressures and allowable leakage rates are within limits of Table 6.2.60.

TABLE 14.2-132

SECONDARY CONTAINMENT LEAKAGE TEST

Test Objectives

To verify overall secondary containment integrity by subjecting the reactor building to a specified negative pressure and ensuring that the inleakage is within design limits.

Safety Precautions

Follow all NMPC safety rules and proper procedures during testing.

Prerequisites

1. All applicable preliminary tests are complete and the structures turned over to NMPC.

2. All applicable motor control centers to supply electric power to motors, control circuits, and instrumentation are available.

3. Valve lineups are complete.

4. Reactor building ventilation and standby gas treatment systems are available.

5. Reactor building airlocks are installed and can be operated to support the test.

6. Reactor building conduit, pipe, and other structural penetrations are sealed.

Test Procedure

With the standby gas treatment system operating at a specific capacity to maintain the reactor building internal structure at a specified negative pressure the resultant inleakage will be verified.

Acceptance Criteria

The reactor building leakage rate is not greater than 3,160 scfm.

TABLE 14.2-201

CHEMICAL AND RADIOCHEMICAL

Startup Test (SUT-1)

Test Objectives

1. To secure information on the chemistry and radiochemistry of the reactor coolant.

2. To verify that the sampling equipment, procedures, and analytic techniques are adequate to demonstrate that the chemistry of all parts of the entire reactor system meets specifications and process requirements.

Specific objectives of the test program include evaluation of fuel performance, evaluations of demineralizer operations by direct and indirect methods, measurements of filter performance, confirmation of condenser integrity, demonstration of proper steam separator-dryer operation, measurement and calibration of the off-gas system, and calibration of certain process instrumentation. Data for these purposes are secured from a variety of sources: plant operating records, regular routine coolant analysis, radiochemical measurements of specific nuclides, and special chemical tests.

Prerequisites

The preoperational tests have been completed, the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

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 initial concentrations. Subsequent to fuel loading during reactor heatup and at each major power level change, samples are taken and measurements are made to determine the chemical and radiochemical quality of reactor water and reactor feedwater, amount of radiolytic gas in the steam, gaseous activities leaving the air ejectors, decay times in the off-gas lines, and performance of filters and demineralizers.

TABLE 14.2-201 (Cont)

Calibrations are made of monitors in the stack, liquid waste system, and liquid process lines.

The following tests are performed:

Action	Test Conditions
1. Reactor water chemistry and radiochemistry.	a. Prior to fuel loading
2. Gaseous and liquid effluents activity monitor.	b. During heatup
	c. Subsequent to major changes in power level

Acceptance Criteria

Level 1:

1. Chemical factors defined in the technical specifications and fuel warranty are maintained within the limits specified.

2. The activity of gaseous and liquid effluents conforms to license limitations.

3. Water quality is known at all times and remains within the guidelines of the water quality specifications.

Level 2:

Not applicable

TABLE 14.2-202

RADIATION MEASUREMENT

Startup Test (SUT-2)

Test Objectives

1. To determine the background radiation levels in the plant environs prior to operation for base data on activity buildup.

2. To monitor radiation at selected power levels to assure the protection of personnel during plant operation.

Prerequisites

The appropriate preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

A survey of natural background radiation throughout the plant site is made prior to fuel loading. Subsequent to fuel loading, during reactor heatup and at power levels of 25, 60, and 100 percent of rated power, gamma radiation level measurements, and where appropriate, neutron dose rate measurements are made at specific locations throughout the plant. All potentially high radiation areas are surveyed.

The following tests are performed:

Action	Test conditions
1. Background radiation level survey. 2. Monitor radiation level periodically during the startup.	a. Prior to fuel loading. b. Fuel loading. c. Reactor heatup. d. Steady-state operation at 25, 60, and 100 percent of rated power.

TABLE 14.2-202 (Cont)

Acceptance Criteria

Level 1:

The radiation doses of plant origin and the occupancy times of personnel in radiation zones are controlled consistent with the guidelines of the standards for protection against radiation outlined in 10CFR20.

Level 2:

Not applicable.

TABLE 14.2-203

FUEL LOADING

Startup Test (SUT-3)

Test Objective

To load fuel safely and efficiently to the full core size.

Prerequisites

Prerequisites to fuel loading are established in Section 14.2.10 and the tests required thereby are implied in those prerequisites. Also, the SORC has approved fuel loading and the following additional prerequisites have been met to assure that fuel loading is performed in a safe manner:

1. All systems required for fuel loading have undergone preoperational testing.

2. Fuel and control rod inspections are complete. Control rods are installed and tested.

3. SRMs are calibrated and operable. IRMs and APRMs have been preoperationally tested and are operable.

4. SRMs are source checked with a neutron source prior to loading and periodically will be functionally checked and source checked.

5. The status of the reactor building is specified and established.

6. Reactor vessel status is specified relative to internal component placement and this placement established to make the vessel ready to receive fuel.

7. Reactor vessel water level is established and minimum level prescribed.

8. The standby liquid control system is operable.

TABLE 14.2-203 (Cont)

Test Procedure

1. Prior to fuel loading, control rods and neutron sources and detectors are installed and tested. Fuel loading begins at the center of the core and proceeds radially to the fully loaded configuration.

2. Control rod functional tests and subcriticality check demonstrations are performed periodically during the loading. A shutdown margin test is performed for the fully loaded core in accordance with SUT 70-4.

The following tests are performed:

Action	Test Conditions
1. Subcritical check	a. During fuel loading
2. Shutdown margin demonstration (full loaded core)	b. Control rods, neutron sources and detectors installed and tested
3. Control rod functional test	

Acceptance Criteria

Level 1:

The partially loaded core is subcritical by at least 0.38-percent $\Delta k/k$ with the analytically determined highest-worth rod fully withdrawn.

Level 2:

Not applicable.

TABLE 14.2-204

FULL CORE SHUTDOWN MARGIN

Startup Test (SUT-4)

Test Objectives

The purpose of this test is to demonstrate that the reactor can be made subcritical with the required margin at any point throughout the fuel cycle with the strongest worth control rod fully withdrawn and all other control rods fully inserted.

Prerequisites

The appropriate preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing.

Test Procedure

This test will be performed in the fully loaded core in the xenon-free condition. The shutdown margin test will be performed by withdrawing the control rods from the all-rods-in configuration until criticality is reached. The approach to criticality will be performed cautiously to prevent achieving criticality within a period shorter than 30 sec. If the highest worth rod will not be withdrawn in sequence, other rods may be withdrawn providing the reactivity worth is equivalent. The difference between the measured K_{eff} and the calculated K_{eff} for the in-sequence critical will be applied to the calculated value to obtain the true shutdown margin.

Acceptance Criteria

Level 1:

The shutdown margin of the fully loaded, cold (68°F or 20°C), xenon-free core occurring at the most reactive time during the cycle must be at least 0.38 percent $\Delta k/k$ with the analytically strongest rod (or its reactivity equivalent) withdrawn. If the shutdown margin is measured at some time during the cycle other than the most reactive time, compliance with the above criterion is shown by demonstrating that the shutdown margin is 0.38 percent $\Delta k/k$ plus an exposure-dependent increment which adjusts the shutdown margin at that time to the minimum shutdown margin.

TABLE 14.2-204 (Cont)

12 Level 2:

Criticality should occur within ±1.0 percent Δ k/k of the predicted critical (predicted critical to be determined later).

TABLE 14.2-206

CONTROL ROD DRIVE SYSTEM

Startup Test (SUT-5)

Test Objectives

1. To demonstrate that the CRD system operates properly over the full range of primary coolant temperatures and pressures from ambient to operating.

2. To determine the initial operating characteristics of the entire CRD system.

Prerequisites

The appropriate preoperational tests have been completed. The SORC has reviewed and approved the test procedures and initiation of testing. The CRD manual control system preoperational testing must be completed on CRDs being tested. The reactor vessel, closed loop cooling water system, condensate supply system, and instrument air system must be operational to the extent required to conduct the test.

Test Procedure

The CRD tests performed during the startup test program are designed as an extension of the tests performed during the preoperational CRD system tests. Thus, after it is verified that all CRDs operate properly when installed, they are tested periodically during heatup to assure that there is no significant binding caused by thermal expansion of the core components. A list of all CRD tests to be performed during startup testing is as follows:

CONTROL ROD DRIVE SYSTEM TESTS

Action	Accumulator Pressure	Test Conditions Reactor Pressure with Core Loaded psig (kg/cm^2) 0	600(42.2)	800(56.2)	Rated
Position Indication		All			

TABLE 14.2-206 (Cont)

CONTROL ROD DRIVE SYSTEM TESTS

Action	Accumulator Pressure	Test Conditions Reactor Pressure with Core Loaded psig (kg/cm^2) 0	600(42.2)	800(56.2)	Rated
Normal Stroke Times Insert/ Withdraw		All			4*
Coupling		All***			
Friction		All			All
Scram	Normal		4*	4*	All
Scram	Minimum	4*			
Scram	Zero				4*
Scram	Normal				4**

* Refers to four CRDs selected for continuous monitoring based on slow normal accumulator pressure scram times or unusual operating characteristics, at zero reactor pressure or rated reactor pressure when this data is available. The four selected CRDs must be compatible with the rod worth minimizer, RSCS system, and CRD sequence requirements.

** Scram times of the four slowest CRDs (based on scram data at rated pressure) will be determined at test conditions 2, 3, and 6 during planned reactor scrams.

*** Establish that this check is normal operating procedure.

NOTE: Single CRD scrams should be performed with the charging valve closed. (Do not ride the charging pump head.)

TABLE 14.2-206 (Cont)

Criteria

Level 1:

a) Each CRD must have a normal withdraw speed less than or equal to 3.6 inches per second (9.14 cm/sec), indicated by a full 12-foot stroke in greater than or equal to 40 seconds.

b) The mean scram time of all operable CRDs must not exceed the following times: (Scram time is measured from the time the pilot scram valve solenoids are deenergized.)

Position Inserted from Fully Withdrawn	Scram Time (Seconds)	
45	0.43	
39	0.86	
25	1.93	
05	3.49	12

c) The mean scram time of the three fastest CRDs in a two-by-two array must not exceed the following times: (Scram time is measured from the time the pilot scram valve solenoids are deenergized.)

Position Inserted from Fully Withdrawn	Scram Time (Seconds)
45	0.45
39	0.92
25	2.05
05	3.70

Level 2:

a) Each CRD must have a normal insert or withdraw speed of 3.0 ± 0.6 ips (7.62 ± 1.52 cm/sec), indicated by a full 12-ft stroke in 40 to 60 sec.

b) With respect to the CRD friction tests, if the differential pressure variation exceeds 15 psid
(1.1 kg/cm^2) for a continuous drive in, a settling test 12
must be performed, in which case the differential settling pressure should not be less than 30 psid
(2.1 kg/cm^2) nor should it vary by more than 10 psid 12
(0.7 kg/cm^2) over a full stroke.

TABLE 14.2-206 (Cont)

THE INFORMATION ON THIS PAGE HAS BEEN DELETED.

TABLE 14.2-207

SOURCE RANGE MONITOR
PERFORMANCE AND ROD CONTROL SEQUENCE

Startup Test (SUT-6)

Test Objective

To demonstrate that the operational sources, SRM instrumentation, and rod withdrawal sequences provide adequate information to achieve criticality and increase power in a safe and efficient manner.

Prerequisites

The preoperational tests have been completed, and the SORC has reviewed and approved the test procedure and the initiation of testing. The CRD system must be operational.

Test Procedure

The operational neutron sources are installed, and source range monitor count-rate data are taken during rod withdrawals to critical and compared with stated criteria on signal and signal-to-noise count ratio.

A withdrawal sequence has been calculated that completely specifies control rod withdrawals from all-rods-in condition to the rated power configuration. Critical rod patterns are recorded periodically as the reactor is heated to rated temperature.

The following test is performed:

Action	Test Conditions
Rod withdrawal in prescribed sequence	a. After fuel loading. b. Operational neutron sources installed. c. SRM minimum signal-to-noise count ratio and minimum count rate criteria satisfied.

TABLE 14.2-207 (Cont)

Acceptance Criteria

Level 1:

1. There is a neutron signal-to-noise count ratio of at least 2 to 1 on the required operable SRMs or fuel loading chambers.

2. Minimum count rate is in accordance with the technical specifications.

TABLE 14.2-208

CONTROL ROD SEQUENCE EXCHANGE

Startup Test (SUT-8)

Test Objectives

To perform a representative sequence adjustment of control rod patterns at a significant power level.

Prerequisites

The preoperational tests have been completed, the SORC has reviewed and approved the test procedure and the initiation of testing. All system instrumentation is installed and calibrated. All system controls and interlocks have been checked.

Test Procedure

Rod patterns will be periodically adjusted during plant operations to more nearly equalize fuel assembly exposures. This test is performed as an example of the adjustments that will be made throughout plant life and is provided to illustrate the principles involved. The control rod sequence adjustment begins on the 100 percent load line by reducing core flow and reducing thermal power to between the low power set point of the rod worth minimizer (or the rod sequence control system) and the thermal power necessary to keep nodal powers below the preconditioning cladding interim operating management recommendation (PCIOMR) threshold. Also, in reducing thermal power, care should be taken to avoid exceeding the design limits of the core total peaking factor. The ensuing steps involve utilizing the system process computer and TIP machines. The adjustment is made by withdrawing or inserting control rods until target is achieved.

TABLE 14.2-208 (Cont)

The following test is performed:

Action	Test Conditions
Demonstrate the rod sequence adjustment procedure	a. Reduce recirculation flow. b. Sufficient margin available to PCIOMR envelope and core operating limits.

Acceptance Criteria

Level 1:

Completion of the adjustment of one rod pattern for the complementary pattern with continual satisfaction of all licensed core limits constitutes satisfaction of the requirements of this procedure.

Level 2:

All nodal powers will remain below their PCIOMR threshold limit during this test.

TABLE 14.2-209

INTERMEDIATE RANGE MONITOR PERFORMANCE

Startup Test (SUT-10)

Test Objective

To adjust the IRM system to obtain an optimum overlap with the SRM and APRM systems.

Prerequisites

The preoperational tests have been completed. The SORC has reviewed and approved the test procedures and the initiation of testing. All SRMs and pulse preamplifiers, IRMs and voltage preamplifiers, and APRMs have been calibrated in accordance with vendor's instructions.

Test Procedure

Initially the IRM system is set to maximum gain. After the APRM calibration, the IRM gains are adjusted to optimize the IRM overlap with the SRMs and APRMs.

The following tests are performed:

Action	Test Conditions
1. Verify IRM-SRM overlap.	Flux level sufficient for IRM response.
2. Verify IRM response to neutron flux.	
3. Adjust IRM gain, if necessary, for proper IRM-APRM overlap.	During first APRM calibration based on a heat balance.

Acceptance Criteria

Level 1:

a) Each IRM channel must be on scale before the SRMs exceed their rod block setpoint.

b) Each APRM must be on scale before the IRMs exceed their rod block setpoint. 12

TABLE 14.2-209 (Cont)

c) The IRMs produce a scram at 120/125% scale in the startup mode.

Level 2:

Each IRM channel must be adjusted so a half-decade overlap with the SRMs and one-decade overlap with the APRMs are assured.

TABLE 14.2-210

LPRM CALIBRATION

Startup Test (SUT-11)

Test Objective

To calibrate the LPRM system.

Prerequisites

The appropriate preoperational tests have been completed, the SORC has reviewed and approved the test procedures and the initiation of testing. Instrumentation for calibration has been checked and installed.

Test Procedure

The LPRM channels are calibrated to make the LPRM readings proportional to the neutron flux in the LPRM water gap at the chamber elevation. Calibration factors are obtained through the use of either an offline or a process computer calculation that relates the LPRM reading to average fuel assembly power at the chamber height.

The following tests are performed:

Action	Test Conditions
1. Verify LPRM flux response. This test may be done in conjunction with rated pressure scram testing (SUT-5).	a. Hot standby or TCI.
2. Take data and calibrate LPRM system.	a. TC-2 and TC-6. b. All systems in NORM mode.

8 TABLE 14.2-210 (Cont)

<u>Acceptance Criteria</u>

Level 1:

Not applicable

Level 2:

Each LPRM reading is within 10 percent of its calculated value.

TABLE 14.2-211

APRM CALIBRATION

Startup Test (SUT-12)

Test Objective

To calibrate the APRM system.

Prerequisites

The preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and the initiation of testing. Instrumentation for calibration has been checked and installed.

Test Procedure

A heat balance is generally made each shift and after each major power level change. Each APRM channel reading is adjusted to be consistent with the core thermal power as determined from the heat balance. During heatup a preliminary calibration is made by adjusting the APRM amplifier gains so that the APRM readings agree with the results of a constant heatup rate heat balance. The APRMs are recalibrated in the power range by a heat balance as soon as adequate feedwater indication is available.

Recalibration of the APRM system is in accordance with the technical specifications.

The following tests are performed:

Action	Test Conditions
1. Calibrate APRM system based on heat balance data.	Constant rate of heatup below rated pressure.
2. Calibrate APRM system based on steady-state heat balance data.	Approximately 25 percent power at TC-2, 3, 5, and 6 and repeated as necessary.

TABLE 14.2-211 (Cont)

<u>Acceptance Criteria</u>

Level 1:

1. The APRM channels are calibrated to read equal to or greater than the actual core thermal power.

2. Technical specification limits on APRM scram and rod block are not exceeded.

3. In the startup mode, all APRM channels produce a scram at less than or equal to 15 percent of rated thermal power.

Level 2:

If the above criteria are satisfied, then the APRM channels will be considered to be reading accurately if they agree with the heat balance or the minimum value required based on peaking factor, MLHGR, and fraction of rated power to within (+7, -0) percent of rated power.

TABLE 14.2-212

NSSS PROCESS COMPUTER

Startup Test (SUT-13)

Test Objective

To verify the performance of the NSSS process computer under plant operating conditions.

Prerequisites

The preoperational tests have been completed and the SORC has reviewed and approved the test procedures and initiation of testing. Computer diagnostic test is completed. Construction and construction testing on each input instrument and its cabling are completed.

Test Procedure

Computer system program verification and calculational program validations at static and at simulated dynamic input conditions are preoperationally tested at the computer supplier's site and following delivery to the plant site. Following fuel loading, during plant heatup and the ascension to rated power, the NSSS and the balance-of-plant system process variables sensed by the computer as digital or analog signals become available. Verify that the computer is receiving correct values of sensed process variables and that the results of performance calculations of the NSSS and the balance-of-plant are correct. At steady-state power conditions the dynamic system test case is performed.

As discussed in Core Performance Tests (SUT-19), the BUCLE offline computation system will be used to evaluate core performance until the process computer performance is verified. A manual computation method is available at the site if either the process computer or BUCLE is not available.

The following tests are performed:

Action	Test Conditions
1. Computer/TIP interface.	Items 1 and 2 do not require reactor operation.
2. Simulated dynamic input test.	

TABLE 14.2-212 (Cont)

Action	Test Conditions
3. Dynamic system test case.	To be completed between TC-1 and TC-3.
4. Obtain data for transmittal to San Jose.	a. Reactor power greater than 80% of rated. b. Core flow at 100% of rated. c. A full core LPRM calibration (OD1) must be completed immediately prior to data taking. d. Scheduled control rod pattern.

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

Programs OD-1, P1, and OD-6 are considered operational when:

1. The MCPR calculated by BUCLE and the process computer either:

   a. Are in the same fuel assembly and do not differ in value by more than 2 percent, or

   b. For the case in which the MCPR calculated by the process computer is in a different assembly than that calculated by BUCLE, for each assembly, the MCPR and CPR calculated by the two methods agree within 2 percent.

2. The maximum linear heat generation rates (LHGRs) calculated by BUCLE and the process computer either:

   a. Are in the same fuel assembly and do not differ in value by more than 2 percent, or

   b. For the case in which the maximum LHGR calculated by the process computer is in a different assembly

TABLE 14.2-212 (Cont)

than that calculated by BUCLE, for each assembly, the maximum LHGR and LHGR calculated by the two methods agree within 2 percent.

3. The maximum average planar LHGRs (MAPLHGR) calculated by BUCLE and the process computer either:

   a. Are in the same fuel assembly and do not differ in value by more than 2 percent, or

   b. For the case in which the MAPLHGR calculated by the process computer is in a different assembly than that calculated by BUCLE, for each assembly, the MAPLHGR and APLHGR calculated by the two methods agree within 2 percent.

4. The LPRM gain adjustment factors calculated by BUCLE and the process computer agree within 2 percent.

NOTE: The remaining programs are considered operational upon successful completion of the static and dynamic testing.

TABLE 14.2-213

RCIC SYSTEM

Startup Test (SUT-14)

Test Objectives

1. To verify the proper operation of the RCIC system over its expected operating pressure and flow ranges.

2. To demonstrate reliability in automatic starting from cold standby when the reactor is at power conditions.

Prerequisites

The appropriate preoperational tests have been completed and the SORC has reviewed and approved the test procedures and the initiation of testing. Initial turbine operation (uncoupled) must be performed to verify satisfactory operation and overspeed trip. The auxiliary steam system is available to supply turbine steam. Instrumentation has been installed and calibrated, and sufficient water is available to meet specified purity requirements. The following systems must be operational to the extent necessary to conduct the test: reactor vessel, suppression pool, condensate supply system, and instrument air.

Test Procedure

The RCIC system is designed to be tested in two ways: flow injection into a test line leading to the condensate storage tank (CST) and flow injection directly into the reactor vessel. The first set of CST injections consists of manual and automatic starts at 150 psig and near rated reactor pressure. The pump discharge pressure during these tests is throttled to 100 psi above reactor pressure to simulate the largest expected pipeline pressure drop. This CST testing is done to demonstrate general system operability and for making most controller adjustments.

Reactor vessel injection tests follow to complete the controller adjustments and to demonstrate automatic starting from a cold (ambient temperature for RCIC operation) standby condition. Cold is defined as a minimum 72 hrs without any kind of RCIC operation. 12

TABLE 14.2-213 (Cont)

After all final controller and system adjustments have been determined, a defined set of demonstration tests must be performed with that one set of adjustments. Two consecutive reactor vessel injections starting from cold conditions in the automatic mode must satisfactorily be performed to demonstrate system reliability. Following these tests, a set of CST injections are done to provide a benchmark for comparison with future surveillance tests.

After the auto-start portion of certain of the above tests is completed, and while the system is still operating, small step disturbances in speed and flow command are input (in manual and automatic mode respectively) to demonstrate satisfactory stability. This is done at both low (above minimum turbine speed) and near rated flow initial conditions to span the RCIC operating range.

A demonstration of expanded operation of up to 2 hr (or until pump and turbine oil temperature are stabilized) of continuous running at rated flow is scheduled at a convenient time during the test program.

Differential pressures measured during rated steam flow will
12 be used to establish appropriate high steam flow setpoints.

The following tests are performed:

Action	Test Conditions
1. CST injection first phase manual start.	a. For all RCIC testing; recirculation in POS mode and all other controllers in NORM mode. b. Demonstration prior to controller adjustments at 150 psig reactor pressure. c. Rated reactor pressure RCIC discharge 100 psi above RPV.
2. CST injection, step changes in flow for controller adjustments.	Immediately after 1c with RCIC discharge to condensate storage tank. Manual and automatic control modes.

TABLE 14.2-213 (Cont)

Action	Test Conditions
3. CST injection, extended operation demonstration.	In conjunction with 2.
4. CST injection, second phase. Hot quick start followed by stability demonstration.	a. Rated reactor pressure, RCIC discharge 100 psi above RPV. b. 150 psig reactor pressure RCIC discharge 100 psi above RPV.
5. Reactor vessel injection, manual start, step changes for controller adjustments.	Rated reactor pressure, manual and automatic modes.
6. Reactor vessel injection hot quick start.	Rated reactor pressure, automatic mode.
7. Reactor vessel injection, hot or cold quick start followed by stability demonstration.	150 psig reactor pressure, manual and automatic modes.
8. Confirmatory reactor vessel injection, cold quick start.	Rated reactor pressure, final RCIC controller settings.
9. Second consecutive confirmatory reactor vessel injection, cold quick start.	Same as 8.
10. Condensate storage tank injection for surveillance test base data, cold quick start.	a. Rated reactor pressure, final controller settings, RCIC discharge approximately 100 psi above RPV. b. 150 psig reactor pressure, final controller settings, RCIC discharge approximately 100 psi above RPV.

TABLE 14.2-213 (Cont)

Acceptance Criteria

Level 1:

1. The average pump discharge flow is equal to or greater than the 100-percent rated value after 30 sec have elapsed from automatic initiation at any reactor pressure between 150 psig and rated.

2. The RCIC turbine does not trip on overspeed during auto or manual starts.

If any Level 1 criteria are not met, the reactor is only allowed to operate up to a restricted power level defined by Figure 14.2-215-1 until the problem is resolved. Also, consult the plant Technical Specifications for actions to be taken.

Level 2:

1. In order to provide an overspeed and isolation trip avoidance margin, the transient start first and subsequent speed peaks must not exceed 5 percent above the rated RCIC turbine speed. 12

2. The speed and flow control loops are adjusted so that the decay ratio of any RCIC system-related variable is not greater than 0.25.

3. The turbine gland seal condenser system is capable of preventing steam leakage to the atmosphere.

4. The Δ P switch for the RCIC steam supply line high-flow isolation trip is calibrated to actuate at 300 percent of the maximum required steady-state flow. 12

TABLE 14.2-214

SELECTED PROCESS TEMPERATURES

Startup Test (SUT-16A)

Test Objective

The purposes of this test are:

1. To ensure that the measured bottom head drain temperature corresponds to bottom head coolant temperature during normal operations.

2. To identify any reactor operating modes that cause temperature stratification.

3. To determine the proper setting of the low flow control limiter for the recirculation pumps to avoid coolant temperature stratification in the reactor pressure vessel bottom head region.

4. To familiarize plant personnel with temperature differential limitations of the reactor system.

Prerequisites

The preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. System and test instrumentation have been calibrated. 12

Test Procedure

The adequacy of bottom drain line temperature sensors will be determined by comparison with recirculation loop coolant temperature when core flow is 100 percent of rated.

During initial heatup while at hot standby conditions, the bottom drain line temperature, recirculation loop suction temperature, and applicable reactor parameters are monitored as the recirculation flow is slowly lowered to either minimum stable flow or the low recirculation pump speed minimum valve position, whichever is the greater. The effects of cleanup flow on vessel temperature stratification will be investigated as operational limits allow. Utilizing this data, it can be determined whether coolant temperature stratification occurs when the recirculation pumps are on and, if so, what minimum recirculation flow will prevent it.

TABLE 14.2-214 (Cont)

Monitoring the preceding information during planned pump trips will determine if temperature stratification occurs in the idle recirculation loops or in the lower plenum when one or more loops are inactive.

All data will be analyzed to determine if changes in operating procedures are required.

The following test is performed:

Action	Test Conditions
Monitor vessel temperatures.	1. During heatup.
	2. At 100 percent core flow (TC-3).
	3. After recirculation pump trips (natural circulation).

Acceptance Criteria

Level 1:

1. The reactor recirculation pumps shall not be started, flow increased, nor power increased unless the coolant temperatures between the steam dome and bottom head drain are within 145°F.

2. The recirculation pump in an idle loop must not be started, active loop flow must not be raised, and power must not be increased unless the idle loop suction temperature is within 50°F of the active loop suction temperature and the active loop flow rate is less than or equal to 50 percent of rated loop flow. If two pumps are idle, the loop suction temperature must be within 50°F of the steam dome temperature before pump startup.

Level 2:

During two-pump operation at rated core flow, the bottom head coolant temperature as measured by the bottom drain line thermocouple is within 30°F of the recirculation loop temperature.

TABLE 14.2-215

WATER LEVEL REFERENCE LEG TEMPERATURE

Startup Test (SUT-16B)

Test Objective

To measure the reference leg temperature and recalibrate the instruments if the measured temperature is different from the value assumed during the initial calibration.

Prerequisites

The preoperational tests have been completed, the SORC has reviewed and approved the test procedures and initiation of testing. System and test instrumentation have been calibrated.

Test Procedures

To monitor the reactor vessel water level, five level instrument systems are provided. These systems and their functions are:

1. Shutdown range - water level measurement in cold, shutdown condition.

2. Narrow range - feedwater flow and water level control functions.

3. Wide range - safety functions.

4. Fuel range - post accident indication.

5. Upset range - water level measurement during transient conditions.

The test is done at rated temperature and pressure and under steady-state conditions and verifies that the reference leg temperature of the instrument is the value assumed during initial calibration. If not, the instruments are recalibrated using the measured value.

Action	Test Conditions
Monitor drywell temperature.	Hot standby with steady drywell temperatures.

TABLE 14.2-215 (Cont)

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

12 The difference between the actual reference leg temperature(s) and the value(s) assumed during initial calibration shall be less than that amount which will result in a scale end point error of 1 percent of the instrument span for each range.

TABLE 14.2-216

SYSTEM EXPANSION

Startup Test (SUT-17)

Test Objectives

To demonstrate that:

1. The piping system during system heatup and cooldown is free to expand and move without unplanned obstruction or restraint.

2. The piping does shake down after a few thermal expansion cycles.

3. The measured values of displacement are within the limits specified by the responsible piping design engineer.

Prerequisites

The appropriate preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing.

Test Procedure

Hanger positions of reactor recirculation piping are recorded after each major thermal cycle until a shakedown has taken place (normally about three cycles). During initial heatup, a visual inspection is made at an intermediate reactor water temperature to ensure that components are free to move as designed. Corrections are made as necessary. Devices for continuously measuring pipe displacement are mounted on the recirculation lines, and motion during heatup is compared with calculated values. Final sensor locations are determined at the site and based on generic recommendations. After receipt of the installed transducer locations, the plant piping design subsection will supply to the startup engineer the expected thermal displacements (Level 2 limits) and the allowable thermal displacements (Level 1 limits) for the above piping and related conditions. These displacements will be specific to each transducer for each coordinate direction.

TABLE 14.2-216 (Cont)

Action	Test Conditions
1. Visual inspection and hanger readings.	a. All control systems in NORM mode. b. Approximately 250°F at accessible locations. c. At ambient and rated temperature. d. After 3 to 5 complete heatup and cooldown cycles.
2. Record displacement sensor readings.	a. At approximately 250°F. b. At rated recirculation temperature. c. At rated feedwater temperature.

<u>Acceptance Criteria</u> (As described in response to Question F210.37).

Level 1:

1. There shall be no obstructions which will interfere with the thermal expansion of the recirculation piping system.

2. The displacements at the established transducer locations shall not exceed the allowable values as provided later by the plant piping design subsection. The allowable values of displacement shall be based on not exceeding ASME Section III Code stress allowables.

Level 2:

The displacements at the established transducer locations shall not exceed the expected values as provided later by plant piping design subsection.

TABLE 14.2-217

TRAVERSING INCORE PROBE
UNCERTAINTY CALCULATIONS

Startup Test (SUT-18)

Test Objective

To determine the reproducibility of the TIP system readings.

Prerequisites

System installation has been completed and preoperational tests completed and verified. The SORC has reviewed and approved the test procedure and initiation of testing. The TIP detector ball valve time delay, core top and bottom limits, clutch, x-y recorder, and purge system are operational. Instrumentation has been calibrated and installed.

Test Procedure

TIP reproducibility consists of a random noise component and a geometric component. The geometric component is due to a variation in the water gap geometry and TIP tube orientation from TIP location to location. Measurement of these components is obtained by taking repetitive TIP readings at a single TIP location, and by analyzing pairs of TIP readings taken at TIP locations that are symmetrical about the core diagonal of fuel loading symmetry.

TIP data is taken at TC-3 and again at near rated power. The TIP data are taken with the reactor operating with an octant symmetric rod pattern and at steady-state conditions.

The total TIP reproducibility is obtained by dividing the standard deviation of the symmetric TIP pair nodal ratios by $\sqrt{2}$. The nodal TIP ratio is defined as the nodal BASE value of the TIP in the lower right half of the core divided by its symmetric counterpart in the upper left half. The total TIP reproducibility value that is compared with the test criterion is the average value of the data sets taken.

The random noise uncertainty is obtained from successive TIP runs made at the common hole, with each of the TIP machines making six runs. The standard deviation of the random noise is derived by taking the square root of the average of the

TABLE 14.2-217 (Cont)

variances at nodal levels 5 through 22, where the nodal variance is obtained from the fractional deviations of the successive TIP values about their nodal mean value.

The geometric component of TIP reproducibility is obtained by statistically subtracting the random noise component from the total TIP reproducibility.

The following test is performed:

Action	Test Conditions
TIP overall uncertainty.	a. Octant symmetric control rod pattern. b. At steady state. c. TC-3 and 6.

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

The total TIP uncertainty (including random noise and geometrical uncertainties) obtained by averaging the
12 uncertainties for all data sets shall be less than 6.0 percent.

TABLE 14.2-218

CORE PERFORMANCE

Startup Test (SUT-19)

Test Objectives

1. To evaluate the core thermal power and flow.

2. To evaluate whether the following core performance parameters are within limits:

   a. MLHGR.

   b. MCPR.

   c. MAPLHGR.

Prerequisites

The preoperational tests have been completed and the SORC has reviewed and approved the test procedure and initiation of testing. System instrumentation has been installed and calibrated and test instrumentation calibrated.

Test Procedure

Core performance evaluation is employed to determine the principal thermal and hydraulic parameters associated with core behavior. These parameters are:

1. Core flow rate.

2. Core thermal power level.

3. MLHGR.

4. MAPLHGR.

5. MCPR.

These core performance parameters are evaluated by manual calculation techniques or may be obtained from the process computer. If the process computer is used as a primary means to obtain these parameters, it must be proven that it agrees with BUCLE within 2 percent on all thermal parameters (SUT-13).

TABLE 14.2-218 (Cont)

If neither BUCLE nor the process computer is available the manual calculation techniques can be used for the core performance evaluation.

The following test is performed:

Action	Test Conditions
Evaluate core thermal power flow and compute the thermal and hydraulic parameter associated with core behavior. Use plant process computer, offline computer system, or manual calculations	a. TC-1, 2, 3, 4, 5, and 6 are necessary for documentation. b. Additional points as necessary to assure compliance with technical specifications.

Acceptance Criteria

Level 1:

1. The MLHGR of any rod during steady-state conditions does not exceed the limit specified by the plant technical specifications.

2. The steady-state MCPR does not exceed the limits specified by the technical specifications.

3. The MAPLHGR does not exceed the limits specified by the technical specifications.

4. Steady-state reactor power is limited to rated core thermal power and values on or below the rated power flow control line. Core flow does not exceed its rated value.

Level 2:

Not applicable.

TABLE 14.2-219

STEAM PRODUCTION

Startup Test (SUT-20)

Test Objective

To demonstrate that the NSSS provides steam sufficient to satisfy all appropriate warranties as defined in the contract.

Prerequisites

Test Procedure

Warranty demonstration consists of recording sufficient data under steady-state conditions to determine the reactor power level, the pressure and quality of the steam, and the steam flow rate from the reactor.

These measurements include the temperature, pressure, and flow rate of feedwater entering the reactor, the energy added to the reactor water by the recirculation drive pumps, the flow rate through and temperature entering and leaving the reactor cleanup system, the flow rate and temperature of the CRD cooling water, the carryover of reactor water into the steam lines, and the steam pressure outside the drywell near the MSIVs.

Each set of measurements is taken at frequent intervals, every 5 or 10 min as appropriate, for a total test run duration of 4 hr. The average measured quantity, suitably corrected for all calibration factors, is used to determine the NSSS output during the test run. Where the contract requires a 100-hr demonstration, two test runs are made, one in the first 50 hr and one in the second 50 hr. The demonstrated output is the average of the values from the two test runs. During the balance of the 100-hr demonstration, the NSSS output is held constant within ±5 percent of the nominal steam flow rate as indicated by the installed plant feedwater instrumentation.

Should the 100-hr warranty run be interrupted once for any reason and a subsequent time for any reason not due to the fault of the customer, subject to the provisions of the

TABLE 14.2-219 (Cont)

contract, it will be repeated. If the test is interrupted a second or subsequent time for any reason due to the fault of the customer or the power grid to which the station is connected, it will be resumed upon coming to full power and continued until the desired test period is accumulated, provided that the minimum continuous period full-power operation has been 24 hr.

The following test is performed:

Action	Test Conditions
Demonstrate steam quality and flow under steady conditions.	a. At conditions prescribed in the nuclear steam system warranty (TC-6). b. Operate continuously for 100 hr.

Acceptance Criteria

Level 1:

1. The NSSS parameters as determined by using normal operating procedures are within the appropriate license restrictions.

2. The NSSS is capable of supplying steam in an amount and quality corresponding to the final feedwater temperature and other conditions shown on the rated steam output curve in the NSSS technical description. The rated steam output curve provides the warrantable reactor vessel steam output as a function of feedwater temperature, as well as warrantable steam conditions at the outboard MSIVs. Thermodynamic parameters are consistent with the 1967 ASME steam tables. Correction techniques for conditions that differ from the contracted conditions will be mutually agreed to prior to the performance of the test.

Level 2:

Not applicable.

TABLE 14.2-220

CORE POWER-VOID MODE

Startup Test (SUT-21)

Test Objective

To measure the stability of the core power-void dynamic response and to demonstrate that its behavior is within specified limits.

Prerequisites

The appropriate preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. System and test instrumentation have been installed and calibrated.

Test Procedure

The core power-void loop mode that results from a combination of the neutron kinetics and core thermal-hydraulic dynamics is least stable near the natural circulation end of the rated 100-percent power rod line. A fast change in the reactivity balance is obtained by a pressure regulator step change (see Test 22) and by moving a very high worth rod one or two notches. Both local flux and total core response will be evaluated by monitoring selected LPRMs during the transients.

The following test is performed:

Action	Test Conditions
1. Move high worth control rod 1 to 2 notches.	a. TC-4 natural circulation. b. Low power region of TC-5 with recirculation flow control valve at minimum valve position. c. Low power region of TC-5 with LFMG power and minimum valve position. d. High power region of TC-5.
2. In conjunction with pressure regular step changes (Test 22).	a. TC-4 and TC-5.

TABLE 14.2-220 (Cont)

<u>Acceptance Criteria</u>

Level 1:

12 The decay ratio of any oscillatory core variable must be less than 1.0 at all test points.

Level 2:

System-related variables may contain oscillatory modes of
12 response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.50.

TABLE 14.2-221

PRESSURE REGULATOR

Startup Test (SUT-22)

Test Objectives

1. To determine the optimum settings for the pressure control loop by analysis of the transients induced in the reactor pressure control system by means of the pressure regulators.

2. To demonstrate the takeover capability of the backup pressure regulator upon failure of the controlling pressure regulator and to set spacing between the set points at an appropriate value.

3. To demonstrate smooth pressure control transition between the control valves and bypass valves when reactor steam generation exceeds steam used by the turbine.

4. To demonstrate that other affected parameters are within acceptable limits during pressure-regulator-induced transient maneuvers. 12

Prerequisites

The preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

The pressure set point is decreased rapidly and then increased rapidly by about 10 psi, and the response of the system is measured in each case. It is desirable to accomplish the set point change in less than 1 sec. At specified test conditions the load limit set point is set so that the transient is handled by control valves, bypass valves, or both. The backup regulator is tested by simulating a failure of the operating pressure regulator so that the backup regulator takes over control. The response of the system is measured and evaluated, and regulator settings are optimized. At certain conditions the test results will be included with the test report in Core

TABLE 14.2-221 (Cont)

12 Power - Void Mode Response (Test 21). This testing yields valuable core stability data in the midfrequency range (i.e., 0.1 to 3.0 Hz).

The following test is performed:

Action		Test Condition					
Operating Mode	Input	1	2	3	4	5	6
CV	Set point	No	Yes	Yes	Yes	Yes	Yes
CV	Fail to backup	No	Yes	Yes	Yes	Yes	Yes
BPV	Set point	Yes	Yes	No	Yes	Yes	Yes
BPV	Fail to backup	Yes	Yes	No	Yes	No	Yes
	Recirculation modes*	MAN	MAN	MAN	MAN	MAN	MAN

12

Acceptance Criteria

Level 1:

The transient response of any pressure control system-related variable to any test input must not diverge.

Level 2:

1. Pressure control system-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25. (This criterion does not
12 apply to tests involving simulated failure of one regulator with the backup regulator taking over.)

2. The pressure response time from initiation of pressure set point change to the turbine inlet pressure peak is ≤10 sec.

3. Pressure control system deadband, delay, etc, is small enough that steady-state limit cycles (if any) produce steam flow variations no larger than ±0.5 percent of rated steam flow.

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12 *Either POS or FLO

TABLE 14.2-221 (Cont)

2. The pressure response time from initiation of pressure set point change to the turbine inlet pressure peak is ≤10 sec.

3. Pressure control system deadband, delay, etc, is small enough that steady-state limit cycles (if any) produce steam flow variations no larger than ±0.5 percent of rated steam flow.

4. For all pressure regulator transients the peak neutron flux and/or peak vessel pressure shall remain below the scram settings by 7.5 percent and 10 psi, respectively. (Maintain a plot of power versus the peak variable values along the 100-percent rod line.)

5. The variation in incremental regulation (ratio of the maximum to the minimum value of the quantity, "incremental change in pressure control signal/incremental change in steam flow," for each flow range) shall meet the following:

Steam Flow Obtained With Valves Wide Open (Percent)	Variation
0 to 85	≤4:1
85 to 97	≤2:1
85 to 99	≤5:1

TABLE 14.2-223

LOSS OF FEEDWATER HEATING

Startup Test (SUT-23B)

Test Objective

To demonstrate adequate response to a feedwater temperature loss.

Prerequisites

The appropriate preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

The condensate/feedwater system is studied to determine the single failure that causes the largest loss in feedwater heating. This event is then performed at between 80- and 90-percent power with the recirculation flow near its rated value.

The following test is performed:

Action	Test Condition
Single event that causes largest decrease in feed-water temprature.	During TC-6 reduce power to between about 80- and 90-percent thermal power, and near 100-percent core flow.

Acceptance Criteria

Level 1:

1. For the feedwater heater loss test, the maximum feedwater temperature decrease due to a single-failure case must be ≤100°F. The resultant MCPR must be greater than the fuel thermal safety limit.

2. The increase in simulated heat flux does not exceed the predicted Level 2 value by more than 2 percent. The predicted value is based on the actual test values of feedwater temperature change and initial power level.

TABLE 14.2-223 (Cont)

Level 2:

The increase in simulated heat flux does not exceed the predicted value referenced to the actual feedwater temperature change and initial power level.

TABLE 14.2-224

FEEDWATER PUMP TRIP

Startup Test (SUT-23C)

Test Objective

To demonstrate the capability of the automatic core flow runback feature to prevent low water level scram following the trip of one feedwater pump.

Prerequisites

The preoperational tests have been completed and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

One of the two operating feedwater pumps is tripped and the automatic recirculation runback circuit acts to drop the power to within the capacity of the remaining feedwater pump. Prior to the test, a simulation of the feedwater pump trip is done to verify the runback capability of the recirculation system.

The recirculation runback is initiated by the pump trip detection equipment and the low water level signal.

The following test is performed:

TABLE 14.2-224 (Cont)

Action	Test Conditions
Trip feedwater pump to demonstrate recirculation system runback scram avoidance. (The Maximum Feedwater Runout Capability test, SUT-23D, and the Recirculation Pump Runback test, SUT-30D, must have already been done.)	a. TC6 b. All systems in NORM mode.

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

12 The reactor shall avoid low-water-level scram by a 3-in margin from an initial water level halfway between the high and low level alarm setpoints.

TABLE 14.2-244 (Cont)

3. The time to place the RHR heat exchangers in the steam condensing mode with the RCIC using the heat exchanger condensate flow for suction must be 1/2 hr or less.

NOTE: If decay heat is not sufficient to demonstrate shutdown cooling mode heat rejection capacity, then heat exchanger capacity may be inferred from data taken in the suppression pool cooling mode, provided that the data were taken with the system as close as possible to the process diagram flows and temperatures.

TABLE 14.2-225

MAXIMUM FEEDWATER RUNOUT CAPABILITY

Startup Test (SUT-23D)

Test Objective

To determine that the maximum feedwater runout capability is compatible with licensing assumptions and to calibrate the feedwater flow.

Prerequisites

The appropriate preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

The test is divided into two parts: 1) the initial calibration of the speed controllers and 2) verification of calibration by measured data, which includes a verification that the maximum feedwater flows do not exceed the flows (different flows at different vessel pressures) in Section 10.4.7.2.

1. The speed controller calibration is done by first obtaining vendor pump performance curves. The pump performance curves are then used to determine the turbine speed corresponding to the maximum allowable flow at rated vessel pressure specified by the FSAR and the minimum speed which corresponds to 0 percent flow at 865 psia. Additionally, for good level control system performance, it is desirable to be able to reach 115 percent NBR flow at 1,075 psia and 68 percent NBR flow at 1,025 psia in the one-pump-tripped condition. Adjustable equipment (i.e., feed pump turbine speed control loops, mechanical limiters, feedwater control system function generators, etc) are set to prevent the feedwater pumps from exceeding their maximum allowed output, and yet allow the desirable performance.

2. During the data collection and verification of calibration portion of the test, pressure, flow, and controller data will be collected between 60 and 100 percent power. Measured data will be compared against expected values to ensure proper calibration. The measured maximum flow will be adjusted to the FSAR

TABLE 14.2-225 (Cont)

The measured maximum flow will be adjusted to the FSAR pressures using the measured data. The maximum flows stated in the FSAR are used as licensing assumptions; therefore, the FSAR maximum flows should not be exceeded. If, however, the FSAR maximum flows are exceeded, there exists two options. The system can be adjusted so that the licensing assumption is not exceeded, or an additional penalty can be applied to the CPR. This penalty will be calculated by the appropriate engineering component, and operating limits modified, where necessary.

Action	Test Conditions
1. Record master controller output, feedwater pump suction, discharge and reactor pressures, feedwater flow rate, flow control valve positions, and actual locations of valve position limiting stops.	a. Four equally spaced feedwater flow points. This can be done at TC-3 or any high-power point achieved prior to commercial operation. b. All systems in NORM mode. c. Maximum number of condensate and feedwater pumps normally operated at 100 percent power shall be running.
2. Determine sensitivity of feedwater flow to reactor pressure over a 30-psi range in 5-psi increments.	a. Reactor power between 80 and 90 percent rated. b. All systems in NORM mode. c. Maximum number of condensate and feedwater pumps normally operated at 100 percent power shall be running.

Acceptance Criteria

Level 1:

Maximum valve position attained shall not exceed the position which will give the following flows with the normal complement of pumps operating.

TABLE 14.2-225 (Cont)

Acceptance Criteria

Level 1:

Maximum speed attained shall not exceed the speeds which will give the following flows with the normal complement of pumps operating.

1. F percent NBR at P psia.

2. [F percent + A(P-P rated)] percent NBR at P rated psia.

The maximum flow, F, the pressure, P, and the slope of the flow variation with pressure, A, should be specified in the FSAR. If any questions remain, contact NSSS Transient Analysis Engineering.

Level 2:

1. The feedwater flow runout capability must not exceed the assumed value in Section 10.4.7.2. | 16

2. With the flow control valve position limiters set, the feedwater system should still meet the following controllability requirements:

   a. 115 percent NBR transient flow capacity at 1,075 psia vessel pressure with the normal pumping configuration.

   b. 68 percent NBR flow capacity at 1,025 psia vessel pressure with no feed pump tripped.

TABLE 14.2-226

TURBINE VALVE SURVEILLANCE

Startup Test (SUT-24)

Test Objective

To demonstrate the acceptable procedures and maximum power levels for surveillance testing of the main turbine control, stop, and bypass valves without producing a reactor scram.

Prerequisites

The appropriate preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

Individual main turbine control, stop, and bypass valves are tested routinely during plant operation as required for turbine surveillance testing. At several test points the response of the reactor is observed, and although it is not required, it is recommended that the maximum possible power level for performance of these tests along the 100-percent load line be established. First actuation should be between 45 and 65 percent power, and used to extrapolate to the next test point between 75 and 90 percent power and ultimately to the maximum power test condition with ample margin to scram. Note the proximity to APRM flow bias scram point and preconditioning cladding interim operating management recommendation (PCIOMR) envelope. The turbine valves are tested manually and reset. The rate of valve stroking and timing of the close-open sequence are such that the minimum practical disturbance is introduced and that PCIOMR limits are not exceeded.

The following tests are performed:

Action	Test Conditions
1. Individually close turbine stop valves.	a. Between 45 and 65 percent power, and again between 75 and 90 percent power, perform third test at chosen maximum power level for all subsequent surveillance

TABLE 14.2-226 (Cont)

Action	Test Conditions
	tests along the 100 percent rod line (nonequilibrium xenon). b. Mode of recirculation system to be determined by testing (to minimize flux peak it is recommended that FLX mode be utilized); all others in NORM mode.
2. Individually close turbine control valves.	Perform the same 3-step power optimization procedure as in the above stop valve test.
3. Individually open turbine bypass valves.	Verify that special considerations are not necessary by testing at maximum power determined in 1a and 2 above.

Acceptance Criteria

Level 1:

12 Not applicable.

Level 2:

1. Peak neutron flux is at least 7.5 percent below the scram trip setting. Peak vessel pressure remains at least 10 psi below the high-pressure scram setting. Peak heat flux must remain at least 5 percent below its scram trip point.

2. Peak steam flow in each line remains 10 percent below the high flow isolation trip setting.

12

TABLE 14.2-227

MAIN STEAM ISOLATION VALVES
FUNCTIONAL TESTS

Startup Test (SUT-25A)

Test Objectives

1. To functionally check the MSIVs for proper operation at selected power levels.

2. To determine isolation valve closure time at rated conditions.

3. To determine maximum power at which a single valve closure can be made without scram.

Prerequisites

The preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

At 5 percent and greater power levels, individual fast closure of each MSIV will be performed to verify their functional performance and to determine closure times. The times to be determined are a) the time from deenergizing the solenoids until the valve stroke from open to closed is complete (t_{sol}), and b) the valve stroke time (t_s). Time t_s equals the interval from when the valve starts to move from full open until it is 100 percent closed (valve stroke complete, i.e., from 0- to 90-degree positions) to determine the maximum power level at which full individual closures can be performed without a scram, first actuation will be performed between 40 percent and 55 percent power, and used to extrapolate to the next test point between 60- and 85-degree power, and ultimately to the maximum power test condition with ample margin to scram.

TABLE 14.2-227 (Cont)

The following tests are performed:

Action	Test Conditions
1. Individually close each MSIV, fast mode.	a. Heatup and between TC-1 and 3, close each MSIV to measure valve timing only. b. Recirculation system in POS mode; other systems in NORM mode.
2. Close fastest MSIV, fast mode.	a. Close one valve between 40 and 55 percent power (TC-2 or 3) and again between 60 and 85 percent power (TC-3 or 5). Perform third test at chosen maximum power condition for all subsequent surveillance tests. b. Recirculation system in POS mode at TC-2 and 3 and FLX mode at TC-5. Other systems in NORM mode.

Acceptance Criteria

Level 1:

The MSIV stroke time (t_S) shall be no faster than 3.0 seconds (average of the fastest valve in each steam line), and for any individual valve 2.5 seconds $\leq t_S \leq 5$ seconds. Total effective closure time for any individual MSIV shall be t_{SOI} plus the maximum instrumentation delay time as determined in preoperational test GE-4 and shall be ≤ 5.5 seconds.

TABLE 14.2-227 (Cont)

Level 2:

1. The reactor shall not scram. The peak neutron flux must be at least 7.5 percent below the trip setting. The peak vessel pressure must remain at least 10 percent psi below the high-pressure scam setting. The peak simulated heat flux must be 5 percent less than its trip point.

2. The reactor shall not isolate. The peak steam flow on each line must remain 10 percent below the high steam flow isolation trip setting.

TABLE 14.2-228

FULL REACTOR ISOLATION

Startup Test (SUT-25B)

Test Objective

To determine the reactor transient behavior that results from the simultaneous full closure of all MSIVs.

Prerequisites

The preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

A test of the simultaneous full closure of all MSIVs is performed at ≥95 percent of rated thermal power. Correct performance of the RCIC, HPCS, and relief valves is shown. Reactor process variables are monitored to determine the transient behavior of the system during and following main steam line isolation. 12

The following test is performed:

Action	Test Conditions
Close all MSIVs (SUT-33 and SUT-5 are to be done in conjunction with this test).	a. Perform at TC-6. b. All systems in NORM mode. 12

Acceptance Criteria

Level 1:

1. Reactor must scram to limit the severity of the neutron flux and simulated fuel surface heat flux transient.

2. Feedwater system settings must prevent flooding of the steam lines.

3. The recorded MSIV full closure times must meet the previously stated timing specifications (SUT-25A).

TABLE 14.2-228 (Cont)

4. The positive change in vessel dome pressure occurring within the first 30 sec after a closure of all MSIV valves must not exceed the Level 2 criteria by more than 25 psi. The positive change in simulated heat flux must not exceed the Level 2 criteria by more than 2 percent of the rated value.

Level 2:

1. The positive change in vessel dome pressure and simulated flux occurring within the first 30 sec after the closure of all MSIV valves must not exceed the BOL predicted values. Predicted values will be referenced to actual test conditions of initial power level and dome pressure and will use BOL nuclear data.

2. Initial action of the RCIC and HPCS are automatic when Level 2 is reached, and system performance is within specifications.

3. Recirculation pump trip shall be initiated if low water level (L2) is reached. Recirculation pump power will shift to the low frequency motor generators if low water level (L3) is reached.

4. The temperature measured by thermocouples on the discharge side of the safety/relief valves must return to within 10°F of the temperature recorded before the valve was opened.

TABLE 14.2-230

RELIEF VALVES

Startup Test (SUT-26)

Test Objectives

1. To verify that the relief valves function properly (can be opened and closed manually).

2. To verify that the relief valves reseat properly after operation.

3. To verify that there are no major blockages in the relief valve discharge piping.

Prerequisites

The preoperational tests have been completed, the SORC has reviewed and approved the test procedures and initiation of testing, and instrumentation has been checked or calibrated as appropriate.

Test Procedure

A functional test of each SRV is made as early in the startup program as practical. This is normally the first time the plant reaches 250 psig. The test is then repeated at rated reactor pressure. Bypass valve (BPV) response is monitored during the low-pressure test and the electrical output response is monitored during the rated pressure test. The test duration is about 10 sec to allow turbine valves and tailpipe sensors to reach a steady state.

The tailpipe sensor responses are used to detect the opening and subsequent closure of each SRV. The BPV and power level (MWe) responses are analyzed for anomalies indicating a restriction in an SRV tailpipe. In addition, lead BWR plants measure SRV tailpipe back pressure on the longest and shortest tailpipes.

Valve capacity is based on certification by ASME code stamp and the applicable documentation being available in the onsite records. The nameplate capacity/pressure rating assumes that the flow is sonic. This is true if the back pressure is not excessive. A major blockage of the line may prevent sonic flow, and it should be determined that no

TABLE 14.2-230 (Cont)

major blockage exists through the BPV or MWe response signatures.

Vendor bench test data of the SRV opening responses are available onsite. The response times of relief valves to reactor steam is measured on the three valves of any type or model not previously installed and tested on a reactor. This procedure is to ensure the validity of the bench testing.

The following tests are performed:

Action	Test Conditions
1. STS: 10-sec manual opening for functional check of valve and sensor response.	a. Heatup at 250 psig. b. STS: Recirculation system in MANUAL mode. Other sytems in NORM mode.
2. Monitor tailpipe sensors, BPV, and MWe for anomalous behavior as each SRV is opened. SUT-33, Drywell Piping Vibration, is to be done in conjunction with this test.	a. Between TC-2 and 3, if any valve is readjusted, repeat test. b. Recirculation system in MAN mode. Other systems in NORM mode.

Acceptance Criteria

Level 1:

There is positive indication of steam discharge during the manual actuation of each valve.

Level 2:

1. Pressure control system-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response is less than or equal to 0.25.

2. The temperature measured by thermocouples on the discharge side of the valves returns to within 10°F of

TABLE 14.2-230 (Cont)

If pressure sensors are available, they return to their initial states upon valve closure.

3. During the 250-psig functional test the steam flow through each relief valve shall not be less than 90 percent of the average relief valve steam flow, as measured by bypass valve position.

4. During the rated pressure test the steam flow through each relief valve, as measured by MWe, is not less than 0.5 percent of rated MWe less than the average of all the valve responses.

TABLE 14.2-231

TURBINE TRIP AND GENERATOR LOAD REJECTION

Startup Test (SUT-27)

Test Objective

To demonstrate the response of the reactor and its control systems to protective trips in the turbine and generator.

Prerequisites

The appropriate preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. All controls and interlocks are checked and instrumentation calibrated.

Test Procedure

1. Turbine trip (closure of the main turbine stop valves within 0.1 sec) and generator trip (closure of the main turbine control valves within 0.3 sec) is performed at selected power levels during the startup test program. At low power levels, reactor protection following the trip is provided by high neutron flux and vessel high-pressure scrams. For the protective trips occurring at intermediate and higher power levels, the reactor scrams by relays, actuated by stop/control valve motion.

2. A generator trip is performed at low power level in such a way that nuclear boiler steam generation is just within the bypass valve capacity to demonstrate scram avoidance.

3. For the trips performed at intermediate power range, reactor scram is most important in controlling the transient peaks.

4. Above 30-percent power, the recirculation pump circuit breakers are both automatically tripped and subsequent transient pressure rise is limited by the opening of the bypass valves initially, and the safety relief valves, if necessary.

5. For the turbine trip, the main generator breakers remain loaded for a time so there is no rise in turbine generator speed, whereas in the generator trip, the main

TABLE 14.2-231 (Cont)

generator breaker opens and the residual turbine steam causes a momentary rise in the generator speed.

The following tests are performed:

<u>Action</u>	<u>Test Conditions</u>
12 1. Generator load rejection, main breaker trip. (SUT-33, Drywell Piping Vibration, is to be done in conjunction with this test.)	a. At TC-1 or 2, just within bypass system capacity. b. Recirculation system in FLO mode; other systems in NORM mode.. c. Manual intervention permissible to prevent high or low water level trip.
2. Main turbine trip scram. (SUT-33, Drywell Piping Vibration, is to be done in conjunction with this test.)	a. TC-3 (60-80% power) at ≥95% core flow. b. All systems in NORM mode.
3. Generator trip scram. (SUT-33, Drywell Piping Vibration, is to be done in conjunction with this test.)	a. Will be done at TC-6. b. All systems in NORM mode.

Previous experience demonstrates that reactor responses to a turbine trip and a generator load rejection at full power are similar for plants like Unit 2 which have steam bypass capacities equivalent to approximately 25 percent of rated power. The load rejection trip is performed at full power to test the turbine overspeed protection system.

<u>Acceptance Criteria</u>

Level 1:

12 1. For turbine and generator trips at power levels greater than 50 percent NBR, there is a delay of less than 0.1 sec following the beginning of control or stop valve closure before the beginning of bypass valve opening. The bypass valves are opened to a point corresponding to greater than or equal to 80 percent of their capacity

TABLE 14.2-231 (Cont)

within 0.3 sec from the beginning of control or stop valve closure motion.

2. Feedwater system settings must prevent flooding of the steam line following these transients.

3. The two pump drive flow coastdown transients during the first 5 sec must be bounded by the criteria that are specified in SUT-30B.

4. The positive change in vessel dome pressure occurring within 30 sec after either generator or turbine trip must not exceed the Level 2 criteria by more than 25 psi.

5. The positive change in simulated heat flux must not exceed the Level 2 criteria by more than 2 percent of rated value.

6. The total time delay from start of turbine stop valve motion or from start of turbine control valve motion, to the complete suppression of electrical arc between the fully open contacts of the RPT circuit breakers shall be less than 190 milliseconds.

Level 2:

1. There shall be no MSIV closure during the first 3 min of the transient, and operator action shall not be required during that period to avoid the MSIV trip. (The operator may take action as he desires after the first 3 min, including switching out of run mode. The operator may also switch out of run mode in the first 3 min if he confirms from measured data that this action did not prevent MSIV closure.)

2. The positive change in vessel dome pressure and in simulated heat flux which occurs within the first 30 sec after the initiation of either generator or turbine trip must not exceed the predicted values.

   (Predicted values are referenced to actual test conditions of initial power level and dome pressure and use beginning-of-life nuclear data. Worst-case design or technical specification values of all hardware performance are used in the prediction, with the exception of control rod insertion time and the delay

TABLE 14.2-231 (Cont)

from beginning of turbine control valve or stop valve motion to the generation of the scram signal. The predicted pressure and heat flux are corrected for the actual measured values of these two parameters.)

3. For the generator trip within the bypass valve capacity, the reactor must not scram for initial thermal power values within that bypass valve capacity and below the power level of which trip scram is inhibited. The measured bypass capacity (in percent of rated power) is equal to or greater than that used for FSAR analysis.

4. Low level initiation of total recirculation trip, HPCS, and RCIC must not occur.

5. Recirculation LFMG sets must take over after the initiation of RPT and adequate vessel temperature difference must be maintained.

6. Feedwater level control must avoid loss of feedwater due to possible high level (L8) trip during the event.

7. The temperature measured by thermocouples on the discharge side of the safety/relief valves must return to within 10°F of the temperature recorded before the valve was opened.

TABLE 14.2-233

RECIRCULATION FLOW CONTROL VALVE POSITION CONTROL

Startup Test (SUT-29A)

Test Objective

To demonstrate the recirculation flow control system's capability, while in the valve position (POS) mode.

Prerequisites

The appropriate preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. All controls are checked and instrumentation calibrated.

Test Procedure

The testing of the recirculation flow control system follows a building-block approach while the plant is ascending from low to high power levels. Components and inner control loops are tested first, followed by drive flow control and plant power maneuvers to adjust and then demonstrate the outer loop controller performance. Preliminary component and valve position loop tests are run when the plant is in cold shutdown in order to visually observe the hydraulic cylinder response. While operating at low power with the pumps using the low-frequency power supply, small step changes are input into the position controller and the responses recorded.

The following test is performed:

Action	Test Conditions
1. Small and large step changes input into position controller.	a. Prior to plant heatup, reactor shutdown, recirc pumps off. (Preoperational testing results may be used to satisfy this testing requirement.)

TABLE 14.2-233 (Cont)

2. Small step changes input into position controller.	a. Before or at TC-1 with pumps using low frequency power supply; at TC-3; between TC-5 and 6. b. Recirculation system in POS mode; other systems in NORM mode.

Acceptance Criteria

Level 1:

The transient response of any recirculation system-related variables to any test input must not diverge.

Level 2:

1. Recirculation system-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25.

2. Maximum rate of change of valve position shall be 10 ± 1 percent/sec.

   During TC-3 and TC-6 while operating on the high speed (60 Hz) source, gains and limiters shall be set to obtain the following response.

3. Delay time for position demand step shall be:

   For step inputs of 0.5 percent to 5 percent ≤0.15 sec

   For step inputs of 0.2 percent to 0.5 percent (see Figure 14.2-234-1)

4. Response time for position demand step shall be:

   For step inputs of 0.5 percent to 5 percent ≤0.45 sec

   For step inputs of 0.2 percent to 0.5 percent (see Figure 14.2-233-1)

TABLE 14.2-233 (Cont)

5. Overshoot after a small position demand input (1 to 5 percent) step shall be <10 percent of magnitude of input. 16

TABLE 14.2-234

RECIRCULATION FLOW LOOP CONTROL

Startup Test (SUT-29B)

Test Objectives

1. To demonstrate the core flow system's control capability over the entire flow control range including core flow, neutron flux.

2. To determine that all electrical compensators and controllers are set for desired system performance and stability.

Prerequisites

The preoperational tests have been completed; the SORC has reviewed and approved the test procedures and initiation of testing. All controls are checked and instrumentation calibrated.

Test Procedure

Following the initial position mode tests of Part 1 the final adjustment of the position loop gains, flow loop gains, and preliminary values of the flux loop adjustments are made on the midpower line. This is the most extensive testing of the recirculation control system. The core power distribution is adjusted by control rods to permit a broad range of maneuverability with respect to PCIOMR. In general, the controller dials and gains are raised to meet the maneuvering performance objectives. Thus the system is set to be the slowest that will perform satisfactorily, in order to maximize stability margins and minimize equipment wear by minimizing actuator motion.

Because of PCIOMR power maneuvering rate restrictions, the fast flow maneuvering adjustments are performed along a mid-power rod line, and an extrapolation is made to the expected results along the 100-percent rod line. The utility has the option to decide to:

1. Perform the faster power changes on the 100-percent rod line that are greater than what the PCIOMR allows, or

2. Accept the mid-power load line demonstrations as acceptable proof of maneuverability.

TABLE 14.2-234 (Cont)

For immediate commercial operation, the flux loop is set slower, and the operator limits his action in the manual mode. If PCIOMRs are ever withdrawn, the tested faster auto settings can be inserted onto the controller with only a brief dynamic test, rather than a full startup test.

The following tests are performed:

Action	Test Conditions
1. Large and small step and ramp inputs.	a. Between TC-2 and 3. b. Recirculation system in FLO and FLX modes; other systems in NORM mode. c. Normal power sources to be used as applicable.
2. Step and ramp input changes to demonstrate satisfactory response.	a. Between TC-5 and 6. b. Recirculation system in FLO and FLX modes; other systems in NORM mode.

Acceptance Criteria

Flow Loops Criteria

Level 1:

The transient response if any recirculation system-related variable to any test input must not diverge.

Level 2:

1. The decay ratio of the flow loop response to any test inputs must be <0.25.
2. The flow loops provide equal flows in the two loops during steady-state operation. Flow loop gains should be set to correct a flow imbalance in about 20 ± 5 sec.
3. The delay time for flow demand step (≤5 percent) must be 0.4 sec or less.

TABLE 14.2-234 (Cont)

4. The response time for flow demand step (≤5 percent) must be 1.1 sec or less.

5. The maximum allowable flow overshoot for step demand of ≤5 percent of rated must be 6 percent of the demand step.

6. The flow demand step settling time must be ≤6 sec.

Flux Loop Criteria

Level 1:

The flux loop response to test inputs must not diverge.

Level 2:

1. Flux overshoot to a flux demand step must not exceed 2 percent of rated for a step demand of ≤20 percent of rated.

2. The delay time for flux response to a flux demand step must be ≤0.8 sec.

3. The response time for flux demand step must be ≤2.5 sec.

4. The flux setting time must be ≤15 sec for a flux demand step ≤20 percent of rated.

TABLE 14.2-234 (Cont)

Scram Avoidance and General Criteria

Level 1:

Not applicable.

Level 2:

For any one of the above loops' test maneuvers, the trip avoidance margins must be at least the following:

1. For APRM ≥7.5 percent.
2. For simulated heat flux ≥5.0 percent.
3. The load following loop response must produce steam flow variations no larger than 0.5 percent of rated steam flow.

TABLE 14.2-234 (Cont)

Flux Estimator Test Criteria

Level 1:

Not applicable.

Level 2:

1. Switching between estimated and sensed flux should not exceed 5 times/5 min at steady state.

2. During flux step transient there should be no switching to sensed flux or if switching does occur, it should switch back to estimated flux within 20 sec of the start of the transient.

Flow Control Valve Duty Test Criteria

Level 1:

Not applicable.

Level 2:

The flow control valve duty cycle in any operating mode must not exceed 0.2 percent - Hz. Flow control valve duty cycle is defined as:

$$\frac{\text{Integrated valve movement in percent (\% Hz)}}{\text{2 x span (in sec)}}$$

TABLE 14.2-235

RECIRCULATION SYSTEM, ONE-PUMP TRIP

Startup Test (SUT-30A)

Test Objectives

1. To obtain recirculation system performance data during the pump trip, flow coastdown, and pump restart.

2. To verify that the feedwater control system can satisfactorily control water level without a resulting turbine trip/scram.

Prerequisites

The appropriate preoperational tests have been completed and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

The reactor coolant recirculation system consists of the reactor vessel and two piping loops. Each loop contains a constant speed centrifugal recirculation pump, a flow control valve, two isolation valves located in the drywell, and 10 jet pumps in parallel, situated in the reactor downcomer. Each recirculation pump takes suction from the reactor downcomer and discharges through a manifold system to the nozzles of the 10 jet pumps. Here the flow is augmented by suction flow from the downcomer and delivered to the reactor inlet plenum.

A potential threat to availability is the high water level turbine trip scram caused by the level upswell that results after an unexpected recirculation one-pump trip. The change in core flow and the resultant power decrease causes void formation which the level sensing system senses as a rise in water level. The one-pump trip tests prove that the water level will not rise enough to threaten a high level trip of the main turbine or the feedwater pumps.

TABLE 14.2-235 (Cont)

The following tests are performed:

Action	Test Conditions
1. Trip one pump. (Drywell piping vibration test [SUT-33] can be done in conjunction with this test.)	a. At TC-3 with core flow ≥95% of rated. b. All systems in NORM mode.
2. Restart pump.	a. Between TC-2 and 3 (with as high a control rod line as possible). b. All systems in NORM mode.
3. Trip other pump. (Drywell piping vibration test [SUT-33] can be done in conjunction with this test).	a. At TC-6. b. All systems in NORM mode.
4. Restart pump using procedures developed during earlier low power restart (Item 2).	a. On 100% load line. b. All systems in NORM mode.

Acceptance Criteria

Level 1:

The reactor shall not scram during the one pump trip recovery.

Level 2:

1. The reactor water level margin to avoid a high level trip is greater than or equal to 3.0 in during the one-pump trip.

TABLE 14.2-235 (Cont)

NOTE: Margin to trip is defined as:

$$\text{Margin} = L8 - (1/2\ (L4 + L7) + \Delta L)$$

where:

ΔL = magnitude of the level swell during the one pump trip event

L8 = high water level trip setting

L4 = low water level alarm setting

L7 = high water level alarm setting

2. The simulated heat flux margin to avoid a scram is greater than or equal to 5.0 percent during the one-pump trip and during pump trip recovery.

3. The APRM margin to avoid a scram is greater than or equal to 7.5 percent during the one-pump trip recovery.

TABLE 14.2-236

RECIRCULATION SYSTEM, TWO-PUMP TRIP

Startup Test (SUT-30B)

Test Objective

To record and verify acceptable performance of the recirculation two-pump circuit trip system.

Prerequisites

The appropriate preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

In case of higher power turbine or generator trips, there is an automatic opening of circuit breakers in the pump power supply. The result is a fast core flow coastdown that helps reduce peak neutron and heat flow in such events. This two-pump trip test verifies that this flow coastdown is satisfactory prior to the high power turbine generator trip tests and subsequent operation.

The following test is performed:

Action	Test Conditions
Simulate TG-initiated RPT to trip all four RPT breakers simultaneously. (SUT-33, Drywell Piping Vibration, can be done in conjunction with this test.)	a. At TC-3 above 50 percent rated power and at 95 percent or more of rated core flow but before SUT-27, Turbine Trip and Generator Load Rejection. b. All systems in NORM mode. Water level may be lowered to avoid possible turbine trip scram.

TABLE 14.2-236 (Cont)

Acceptance Criteria

Level 1:

The two-pump drive flow coastdown transient during the first 5 sec is bounded by the limiting curves specified in Figure 14.2-236-1. (The limiting curves will be determined based upon measurement of the recirculation flow delta . P using the elbow flowmeters, transmitter time delay, and time constant.)

Level 2:

Not applicable.

TABLE 14.2-237

RECIRCULATION SYSTEM PERFORMANCE

Startup Test (SUT-30C)

Test Objective

To record recirculation system parameters during the power test program.

Prerequisites

The preoperational tests are complete. The SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

Recirculation system parameters are recorded at several power-flow conditions and in conjunction with single pump trip recoveries.

The following test is performed:

Action	Test Conditions
Record steady-state operating data.	a. At TC-2, 3, 4, and 6. b. During recovery from single pump trips of SUT-30A.

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

1. The core flow shortfall shall not exceed 5 percent at rated power.

2. The measured core ΔP shall not be >0.6 psi above prediction.

3. The calculated jet pump M ratio shall not be <0.2 points below prediction.

TABLE 14.2-237 (Cont)

4. The drive flow shortfall shall not exceed 5 percent at rated power.

5. The measured recirculation pump efficiency shall not be >8 percent points below the vendor-tested efficiency.

6. The nozzle and riser plugging criteria shall not be exceeded.

TABLE 14.2-238

RECIRCULATION PUMP RUNBACK

Startup Test (SUT-30D)

Test Objective

To verify the adequacy of the recirculation runback to prevent a scram on loss of one feedwater pump and subsequent Level 4.

Prerequisites

The appropriate preoperational tests have been completed. The SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

While operating at near rated recirculation flow, a loss of a feedwater pump is simulated. The transient and final condition are studied to determine the adequacy of the system in preventing a scram during the scheduled loss of a single feedwater pump trip test (SUT-23C).

The following test is performed:

Action	Test Conditions
Simulate loss of feedwater pump to initiate recirculation runback mode.	a. At TC-3 with core flow ≥95% of rated. b. All systems in NORM mode.

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

The recirculation flow control valves shall run back to 45 percent drive flow upon a trip of the runback circuit.

TABLE 14.2-239

RECIRCULATION SYSTEM CAVITATION

Startup Test (SUT-30E)

Test Objective

To verify that no recirculation system cavitation occurs in the operable region of the power-flow map.

Prerequisites

The appropriate preoperational tests have been completed. The SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

Both the jet pumps and the recirculation pumps will cavitate at conditions of high flow and low power where NPSH demands are high and little feedwater subcooling occurs. However, the recirculation flow will automatically run back upon sensing a decrease in subcooling (as measured by the difference between the steam dome and recirculation loop temperature) to lower the reactor power. It will be verified that these limits are sufficient to prevent operation where recirculation pump or jet pump cavitation is predicted to occur.

The recirculation system flow control valves will cavitate at conditions of high differential pressure and low power (low subcooling). The recirculation flow will automatically run back upon sensing a decrease in subcooling (as measured by a low feedwater flow). This limit will be verified to ensure that operation is prevented where flow control valve cavitation may occur.

In both of these cases, flow runback is accomplished by a shift in the power supply to the recirculation pump motors from normal power to the low frequency motor generators.

TABLE 14.2-239 (Cont)

The following test is performed:

Action	Test Conditions
Insert control rods until cavitation occurs or until a cavitation interlock initiates recirculation pump runback, whichever occurs first.	a. At TC-2 and 3. b. All systems in NORM mode.

12

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

Runback logic settings are adequate to prevent operation in areas of potential cavitation.

TABLE 14.2-240

LOSS OF TURBINE GENERATOR AND OFFSITE POWER

Startup Test (SUT-31)

Test Objective

To determine the electrical equipment and reactor transient performance during the loss of auxiliary power.

Prerequisites

The appropriate preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

The loss of auxiliary power test is performed at 20 to 30 percent of rated power. The proper response of reactor plant equipment, automatic switching equipment, and the proper sequencing of the diesel generator load are checked. Appropriate reactor parameters are recorded during the resultant transient. The loss of power will be maintained long enough for plant conditions to stabilize (≥30 min). Systems which do not affect vessel level and pressure may be manually started and operated, as necessary.

The following test is performed:

Action	Test Conditions
After transferring auxiliary loads to the unit auxiliary transformer and starting main turbine dc oil pump, use the trip relay to trip the main generator. (SUT-33, Action Item 1, can be done in conjunction with this test.)	a. At TC-2.. b. Recirculation system in POS mode. All other systems in NORM mode.

TABLE 14.2-240 (Cont)

Acceptance Criteria

Level 1:

1. All safety systems such as the RPS, diesel generators, and HPCS must function properly without manual assistance, and HPCS and/or RCIC system action, if necessary, shall keep the reactor water level above the initiation level of the LPCS, LPCI, ADS, and MSIV closure. Diesel generators shall start automatically.

Level 2:

1. 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. Displays shall not be dependent on specially installed instrumentation.

2. If safety/relief valves open, the temperature measured by thermocouples on the discharge side of the safety/relief valves must return to within 10°F of the temperature recorded before the valve was opened.

TABLE 14.2-241

DRYWELL PIPING VIBRATION

Startup Test (SUT-33)

Test Objectives

1. To verify that the vibration of the reactor recirculation is within acceptable limits.

2. To verify that stresses are within code limits during operating transient loads.

Prerequisites

The appropriate preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

This test is an extension of the system expansion test (SUT-17). Consult the specification of SUT-17 for piping considered to be within the scope of testing.

Because of limited access due to high radiation levels, no visual observation is required during the startup phase of the testing. Remote measurements of piping vibrations are made during the following steady-state conditions:

1. Recirculation at minimum flow and coincident temperature.

TABLE 14.2-241 (Cont)

2. Recirculation at 50 percent ±5 percent of rated flow and operating temperature.

3. Recirculation at 75 percent ±5 percent of rated flow and operating temperature.

4. Recirculation at 100 percent of rated flow.

During the operating transient load testing the amplitude of displacement and number of cycles per transient of the recirculation piping are measured, and the displacements compared with acceptance criteria. Remote vibration and deflection measurements are taken during the following transients:

1. Recirculation pump start.

2. Recirculation pump trip at 100 percent of rated flow.

The locations to be monitored and predicted displacements for the monitored locations in each plant will be provided later.

The following tests are performed:

Action	Test Conditions
Record recirculation loop vibration	a. Recirc. at minimum flow at TC-1 b. At 50, 75, and at approximately 100% of rated recirculation flow on 100% load line. c. In conjunction with recirculation pumps starts and trips (Tests 30A and B) at TC-3 and 6. d. In conjunction with Test 71 while at 100% of rated RHR flow in the shutdown cooling mode.

TABLE 14.2-241 (Cont)

Acceptance Criteria

Level 1:

1. Operating transients: Level 1 limits on piping displacements are prescribed in GE Test Specification No.5 23A4138. These limits are based on keeping the loads on piping and suspension components within safe limits. If any one of the transducers indicates that these movements have been exceeded, the test is placed on hold.

2. Operating vibration: Level 1 limits on piping displacement are prescribed in GE Test Specification No. 23A4138. These limits are based upon keeping piping stresses and pipe mounted equipment accelerations within safe limits. If any one of the transducers indicates that the prescribed limits are exceeded, the test is placed on hold.

Level 2:

1. Operating transients: Transducers have been placed near points of maximum anticipated movement. Where movement values have been predicted, tolerances are prescribed for differences between measurements and predictions. Tolerances are based on instrument accuracy amd suspension free play. Where no movements have been predicted, limits on displacement have been prescribed. GE Test Specification No. 23A4138 tabulates allowable movements or movement tolerances for each transducer.

2. Operating vibration: Acceptable levels of operating vibration are prescribed in GE Test Specification No. 23A4138. The limits have been set based on consideration of analysis, operating experience, and protection of pipe mounted components.

TABLE 14.2-241 (Cont)

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TABLE 14.2-242

RECIRCULATION SYSTEM FLOW CALIBRATION

Startup Test (SUT-35)

Test Objective

To perform complete calibration of the installed recirculation system flow instrumentation.

Prerequisites

The appropriate preoperational tests have been completed and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

During the testing program at operating conditions that allow the recirculation system to be operated at rated flow at power, the jet pump flow instrumentation is adjusted to provide correct flow indication based on jet pump flow. After the relationship between drive flow and core flow is established, the flow biased APRM/RBM (rod block monitor) system is adjusted to match this relationship.

The following test is performed:

Action	Test Conditions
Take recirculation system data and recalibrate instrumentation.	a. At TC-3. b. At TC-6.

Acceptance Criteria

Level 1:

Not applicable.

Level 2:

1. Jet pump flow instrumentation is adjusted in such a way that the jet pump total flow recorder provides a correct core flow indication at rated conditions.

TABLE 14.2-242 (Cont)

2. The APRM/RBM flow-bias instrumentation is adjusted to function properly at rated conditions.

3. The flow control system shall be adjusted to limit the maximum core flow to 102.5 percent of rated by limiting the flow control valve opening position.

TABLE 14.2-243

REACTOR WATER CLEANUP SYSTEM

Startup Test (SUT-70)

Test Objective

To demonstrate specific aspects of the mechanical ability of the RWCU. (This test, performed at rated reactor pressure and temperature, is actually the completion of the preoperational testing that could not be done without nuclear heating.)

Prerequisites

The preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

With the reactor at rated temperature and pressure, process variables are recorded during steady-state operation in three modes as defined by the system process diagram: hot standby, normal, and blowdown. A comparison of the bottom head flow indicator and the RWCU inlet flow indicator is made during these modes. The RWCU system sample station is tested at hot process conditions as part of SUT-1.

The following test is performed:

Action	Test Conditions
Take heat balance and pressure data.	a. Reactor at rated temperature and pressure during heatup. b. Cleanup system operate in hot standby, normal, and blowdown modes.

Acceptance Criteria

Level 1:

Not applicable.

TABLE 14.2-243 (Cont)

Level 2:

1. The temperature at the tube side of the nonregenerative heat exchangers does not exceed 130°F in the blowdown mode or 120°F in the normal mode.

2. The pump available NPSH at least 13 ft during the hot standby mode is as defined in the process diagrams.

3. The cooling water supplied to the nonregenerative heat exchangers shall be less than 6 percent above the flow corresponding to the heat exchanger capacity (as determined from the process diagram) and the existing temperature differential across the heat exchangers. The outlet temperature shall not exceed 180°F.

4. Recalibrate bottom head flow indicator against RWCU flow indicator if the deviation is greater than 25 gpm.

5. Pump vibration shall be less than or equal to 2 mils peak-to-peak (in any direction) as measured on the bearing housing, and 2 mils peak-to-peak shaft vibration as measured on the coupling end.

TABLE 14.2-244

RESIDUAL HEAT REMOVAL SYSTEM

Startup Test (SUT-71)

Test Objective

To demonstrate the ability of the RHR system to:

1. Remove heat from the reactor system so that the refueling and nuclear system servicing can be performed.

2. Condense steam while the reactor is isolated from the main condenser.

Prerequisites

The appropriate preoperational tests have been completed, and the SORC has reviewed and approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

Test Procedure

With the reactor at a convenient thermal power, the steam condensing mode of the RHR System is tuned and demonstrated. Condensing heat exchanger performance characteristics are demonstrated. Final demonstration of the condensing mode is done from an isolated condition. During the first suitable reactor cooldown, the shutdown cooling mode of the RHR system is demonstrated. Unfortunately the decay heat load is insignificant during the startup test period. Use of this mode with low core exposure could result in exceeding the 100°F/Hr cooldown rate of the vessel if both RHR heat exchangers are used simultaneously. Late in the test program after accumulating significant core exposure, this demonstration would more adequately demonstrate the heat exchanger capacity. The RHR heat exchangers will also be tested in the suppression pool cooling mode.

The following tests are performed:

TABLE 14.2-244 (Cont)

Action	Test Conditions
1. Controller adjustment based on subsystem perturbations	a. Reactor not isolated above 10% rated power but ≤25% rated power. b. RHR system in steam condensing mode. c. RCIC flow to CST.
2. Demonstration of steam condensing mode.	a. Reactor at hot standby and isolated. b. RCIC flow to RPV.
3. Take heat exchanger capacity data.	a. RHR in shutdown cooling mode. b. After trip or cooldown from TC-6 in order to provide sufficient decay heat. c. RHR in suppression pool cooling mode.

Acceptance Criteria

Level 1:

The transient response of any system-related variable to any test input must not diverge.

Level 2:

1. The RHR system must be capable of operating in the steam condensing, suppression pool cooling, and shutdown cooling modes (with both one and two heat exchangers) at the flow rates and temperature differentials indicated on the process diagrams.

2. System-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25.

TABLE 14.2-403

QUALIFICATION OF GE PRINCIPAL TESTING PERSONNEL DURING STARTUP TESTING

The GE Site Operations Manager meets the equivalent of ANSI N45.2.6, 1978, discussed for a Level III person. The Operations Manager is normally present for preoperational testing and will be SRO certified under the GE certification program.

The GE Operations Superintendent meets the equivalent of ANSI N45.2.6, 1978, discussed for a Level III person or a Level II person. The Operations Superintendent is normally present for preoperational testing and will be SRO certified under the GE certification program.

The GE Shift Superintendents meet the equivalent of ANSI N45.2.6, 1978, discussed for a Level II person. They will also be SRO certified under the GE certification program.

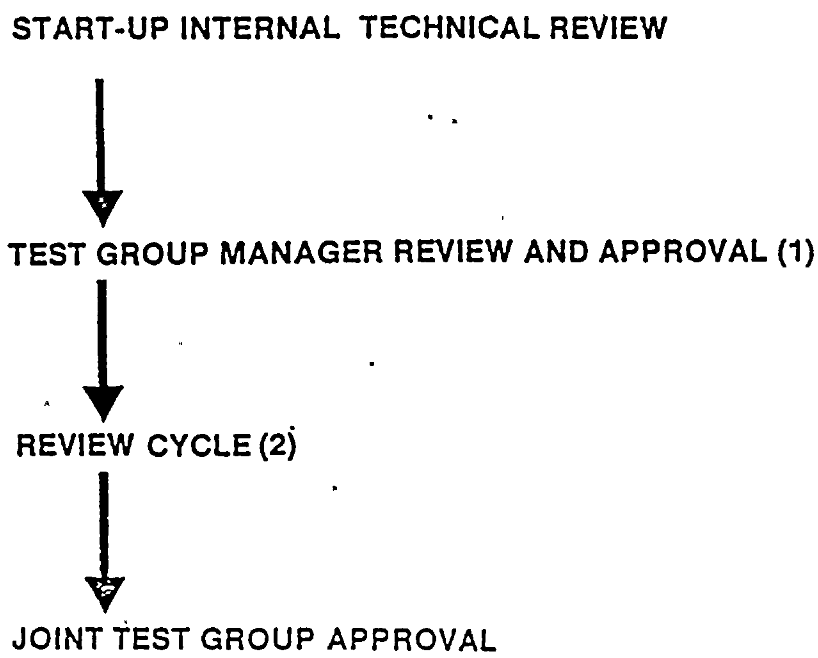
The GE Lead Startup Test Design and Analysis Engineer meets the equivalent of ANSI N45.2.6, 1978, discussed for a Level III person or a Level II person. He is qualified at the time of appointment to the position.

The GE Startup Test Design and Analysis Engineers meet the equivalent of ANSI N45.2.6, 1978, discussed for a Level II person.

The GE Startup Control and Instrumentation Engineers meet the equivalent of ANSI N45.2.6, 1978, discussed for a Level II person.

The GE Startup Chemist meets the equivalent of ANSI N45.2.6, 1978, discussed for a Level II person.

In addition, all GE personnel listed above will meet ANSI 3.1, 1978, Section 4.3.2 minimum qualifications.

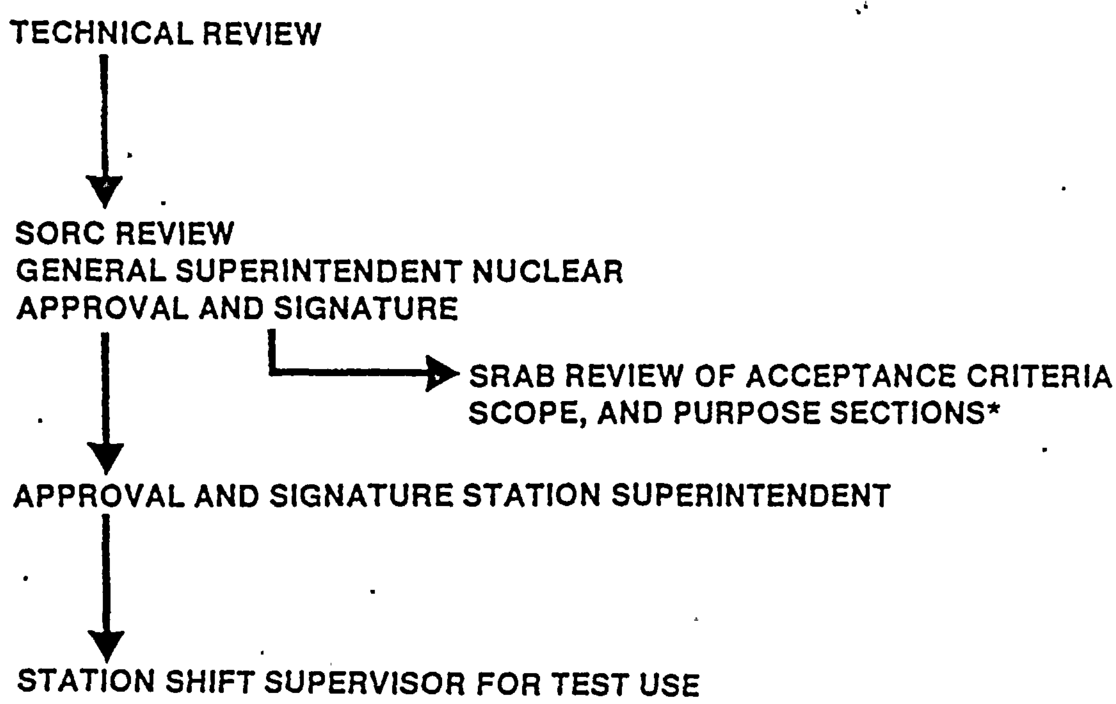


1. FINAL STEP FOR SELECTED PRELIMINARY TESTS.
2. JTG MEMBERS, QUALITY ASSURANCE AND OTHERS AS DESIGNATED BY THE TEST GROUP MANAGER.

FIGURE 14.2-1

REVIEW CYCLE FOR SELECTED PRELIMINARY AND ALL PREOPERATIONAL TEST PROCEDURES

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

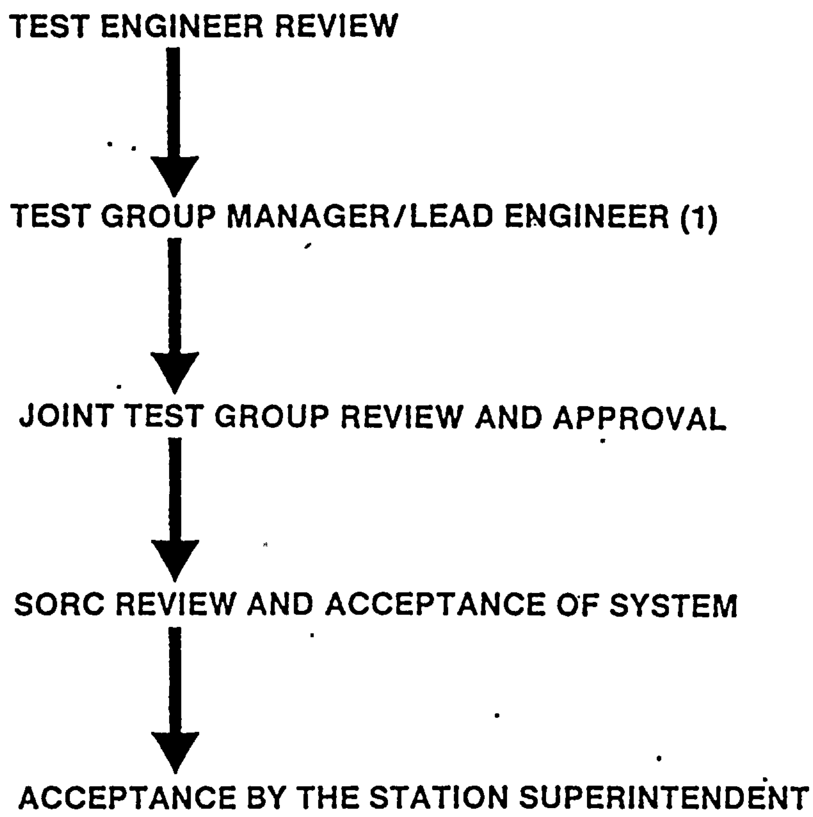


*NOTE THAT THE TEST IS NORMALLY EXECUTED AFTER SRAB CONCURRENCE

FIGURE 14.2-2

REVIEW CYCLE FOR INITIAL STARTUP TEST PROCEDURES

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



1. FINAL STEP FOR PRELIMINARY TEST RESULTS EXCEPT AS NOTED IN 14.2.5.1

FIGURE 14.2-3

PRELIMINARY AND PREOPERATIONAL TEST RESULTS REVIEW

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

SORC REVIEW AND APPROVAL

↓

SRAB REVIEW AND CONCURRENCE*

↓

APPROVAL STATION SUPERINTENDENT

↓

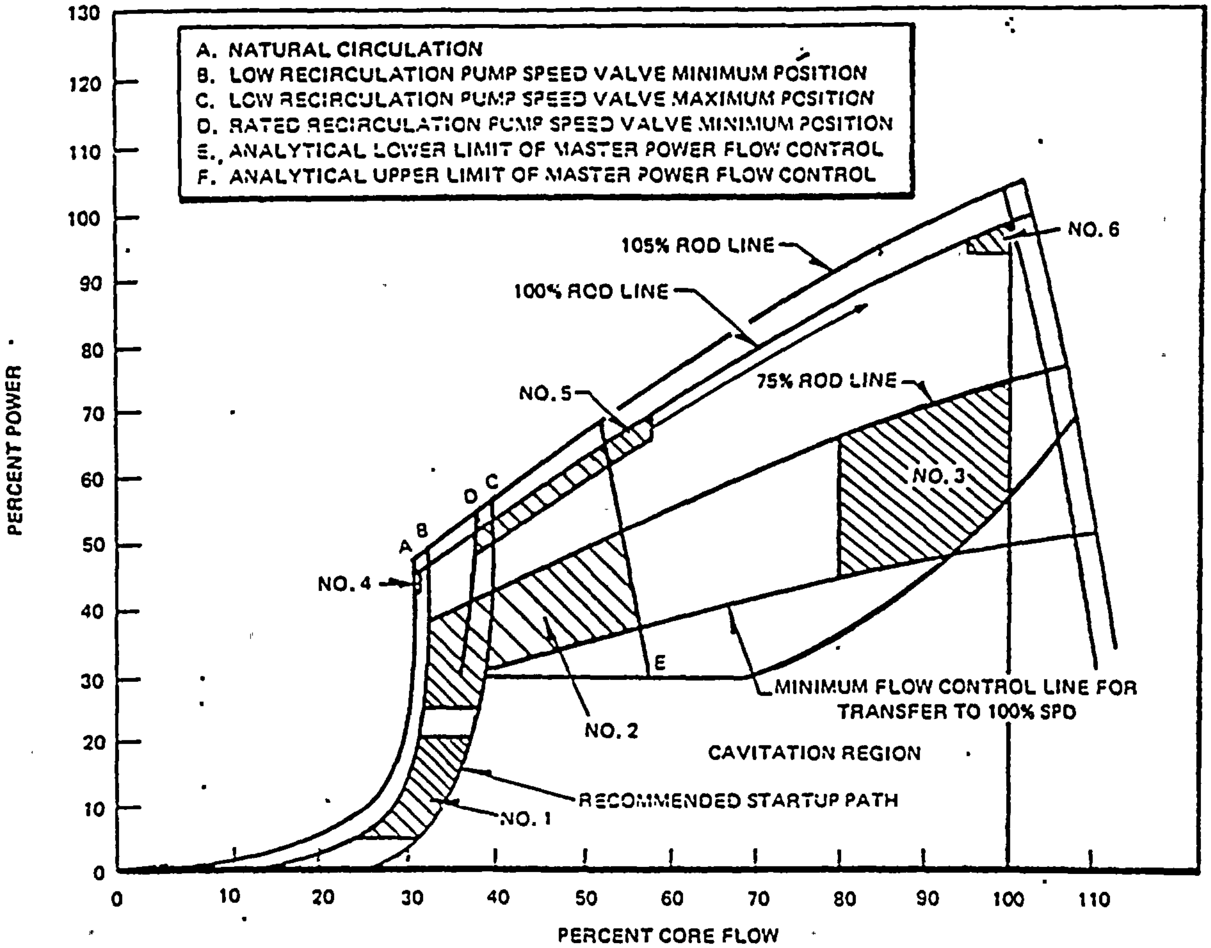
RECORDS MANAGEMENT FILING

*NOTE THAT SRAB REVIEWS THE PURPOSE, SCOPE, ACCEPTANCE CRITERIA, RESULTS, AND EXCEPTIONS.

FIGURE 14.2-4

INITIAL STARTUP TEST
RESULTS REVIEW

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT



CONDITION (TC)

1	BEFORE MAIN GENERATOR SYNCHRONIZATION AND RECIRC PUMPS OPERATING ON LOW FREQUENCY POWER SUPPLY
2	BETWEEN 50% AND 75% CONTROL ROD LINES, AT OR BELOW THE ANALYTICAL LOWER LIMIT OF MASTER FLOW CONTROL MODE
3	FROM 50% TO 75% CONTROL ROD LINES AND CORE FLOW BETWEEN 80% AND MAXIMUM ALLOWABLE
4	NATURAL CIRCULATION AND WITHIN 5% OF THE INTERSECTION WITH 100% ROD LINE
5	MID-POWER RANGE WITHIN 5% OF 100% CONTROL ROD LINE AND 0 TO +5% CORE FLOW OF THE MINIMUM FLOW LINE, FOR MASTER FLOW CONTROL IN MANUAL MODE, AND FOR AUTOMATIC POWER CONTROL IN AUTO MODE
6	WITHIN 0 TO -5% OF RATED THERMAL POWER, AND WITHIN 5% OF RATED CORE FLOW RATE
7	AT 105% OF RATED THERMAL POWER AND 100% CORE FLOW

FIGURE 14.2-5

TEST CONDITION REGION DEFINITION

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

THIS FIGURE
HAS BEEN DELETED

FIGURE 14.2-6

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

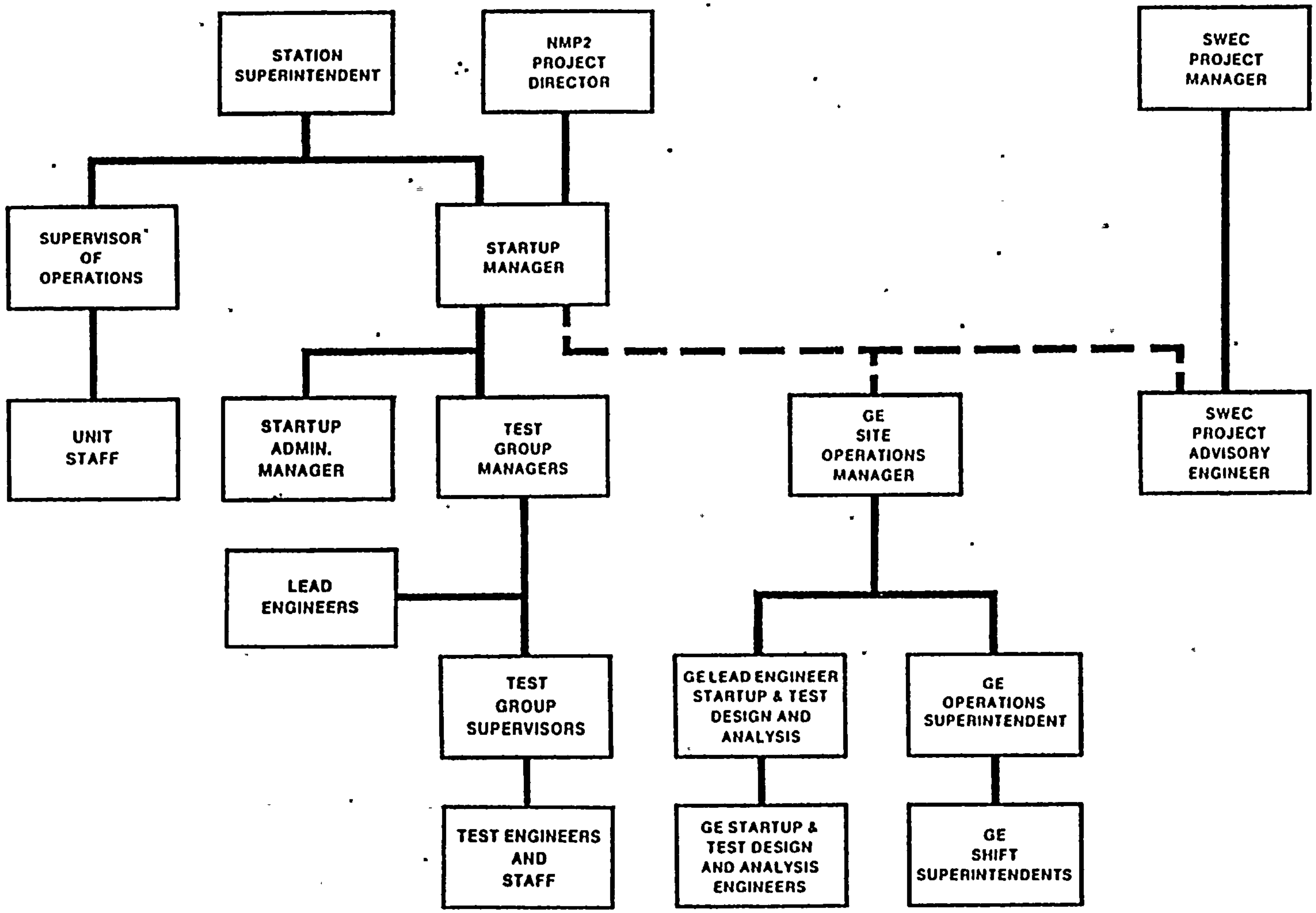


FIGURE 14.2-7

UNIT 2 STARTUP ORGANIZATION

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

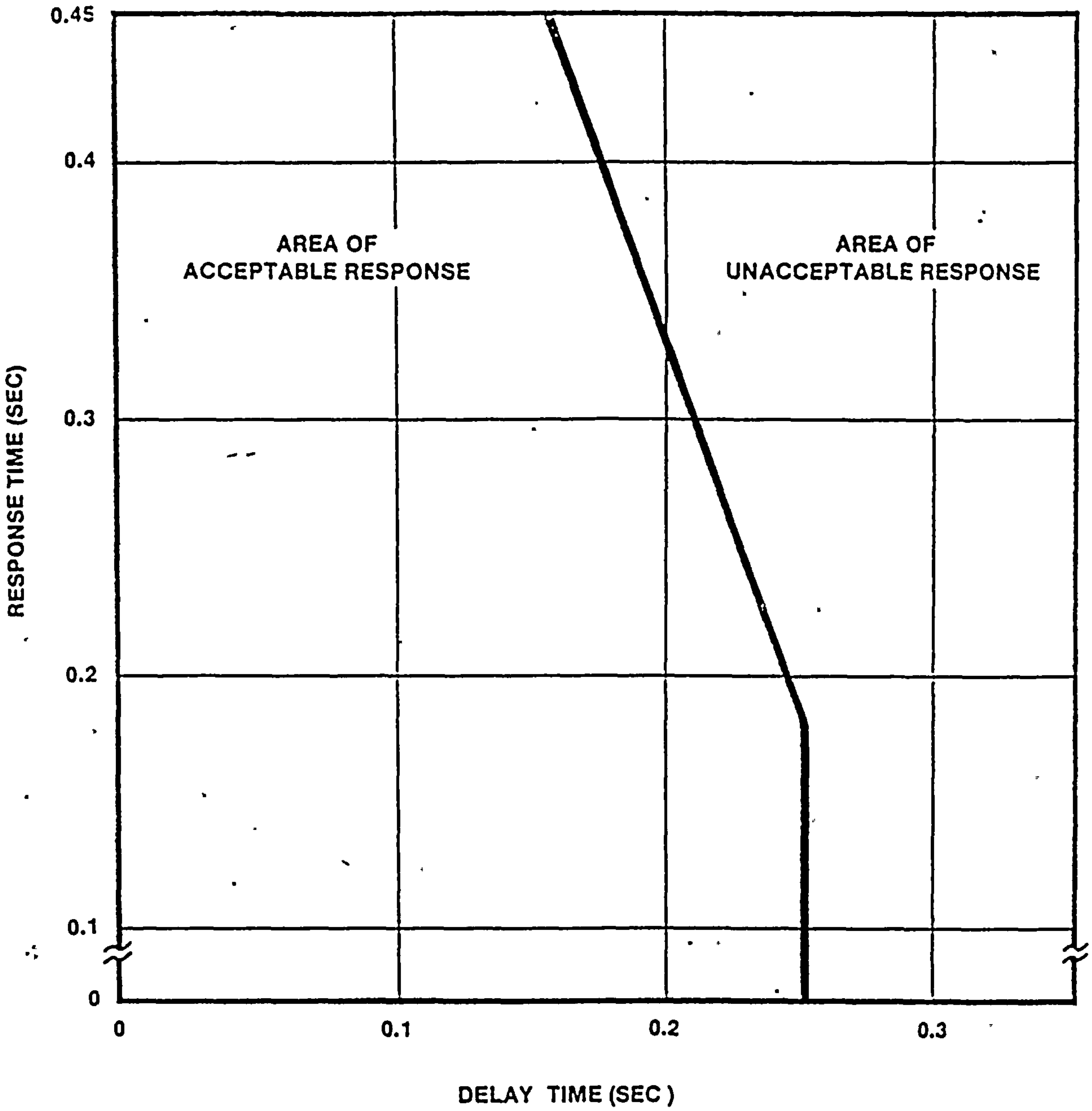


FIGURE 14.2-233-1

TRADEOFF CURVE FOR STEP SIZES 0.2% TO 0.3%

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT-UNIT 2
FINAL SAFETY ANALYSIS REPORT

The following are drafts of the revised responses to the existing FSAR Chapter 14 questions that require modification due to the proposed revision to the chapter. If a response is not included in this list then our review indicates that the submitted amendment does not alter the present response. These revised responses will be formally submitted in the near future.

Q F640.06 — Valves requiring loss of air/N_2 were added to the Table 14.2-43. This amendment adds the ability to do the valves with each system instead of as a group with the air/N_2 systems.

Q F640.08 — 1. NMP2 complies with the intent of this Regulatory Guide. See revised Section 14.2.7 and Tables 14.2-125, 126 and 129.

3. Verification of check valves supplying cooling water to the diesel generators in the Preservice and Inservice Inspection Programs.

4a. See revised test abstract 14.2-129.

4b. The design of the NMP2 Diesel Generator start logic precludes the complete consumption of the starting air on an initial failure to start as described in the subject I&E Information Notice.

Q F640.11 — Revised responses.

2. Cooling ability of the transformers is verified in the LOOP/ECCS test (Table 14.2-129), additional checks are made during the appropriate tests conducted during the Startup Test Phase, such as the 100% warranty run. However we do not intend to perform at these tests at full rated load of the transformers (with the exception of the Main Transformer) as this is impractical, essentially impossible with present design and highly expensive, as it would require temporary buses and circuit breakers capable of handling loads in excessive of present design in order to fully load the transformers and then the acquisition of sufficient high voltage loads and cabling capable of dissipating this enery and finally the installation (and removal, if not permanent) of this equipment. Present plan is to use maximum available loads in plant and verify that the transformer temperatures are within specification.

3. All in-plant power generating equipment which supply power to vital ac buses will be full load tested. See revised test abstracts 14.2-95, 123, 125 and 126.

4. See revised test abstract 14.2-129.

Q F640.13 Verification of emergency heat removal rates cannot be performed during the Preoperational Test Phase due to the lack of heat producing sources. Measurements of the applicable parameters (temperatures and flows) will be performed during the Startup Test Phase during the various tests in which sufficient heat is being produced in the ESF equipment areas. These values will be reviewed and evaluated by NMPC Engineering to insure the heat removal rates are adequate and correspond to the design calculations.

Q F640.19 All radiation detection and monitoring devices for the Liquid and Solid Radwaste Systems are included in the Digital Radiation Monitoring equipment (Table 14.2-105). Calibration of these devices is performed using "spiked" samples and/or sources as a prerequisite to the preoperational test. The operation of a percentage of these devices is reverified during the preoperational test. The operational interfaces of the remaining devices are also verified in the preoperational test using simulated or test signals.

Q F640.22 Incorrect table is referenced. Should be 14.2-104 not 14.2-90.

Q F640.34 Revised responses.

1.L(5) Condenser off-gas isolation and logic associated with this feature is tested as part of the radiation monitoring (table 14.2-106) and Off-Gas (Table 14.2-60) systems preoperational tests.

1.L(7) Liquid Radwaste effluent isolation - instrumentation and logic associated with this feature is tested as part of the radiation monitoring systems. (Table 14.2-105)

1.n(3) Ventilation chilled water systems will be tested during the HVAC preoperational tests.

1.m(3)	Leak tests of sectionalizing devices and drains, gasket or bellows leak tests in the refueling canal will be tested prior to the Fuel Pool Cooling System Preoperational Test. (Table 14.2-56)
1.o(1)	Polar crane and hoist dynamic and static load tests are performed as a prerequisite to the polar crane preoperational test (Table 14.2-110).
Q F640.34-2	Abstract 14.2-70 has been deleted. This system is not considered to required a preoperational test as defined by Reg. Guide 1.68 and its testing is therefore not described in the FSAR.
Q F640.35	Revised responses.

1. These tests, justification for their delay and the time anticipated for their performance will be provided by fourth quarter 1985.

2. The methods for obtaining changes to approved preoperational and startup test procedures is described in FSAR Section 14.2.4.4. No requirement exists for prior NRC notifications for changes to preoperational test procedures.