SEABROOK STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

CHAPTER 14
INITIAL TEST PROGRAM

SECTIONS

14.1 SPECIFIC INFORMATION TO BE INCLUDED IN PSAR

Not applicable to Updated FSAR.

14.2 SPECIFIC INFORMATION TO BE INCLUDED IN UPDATED FSAR

14.2.1 Summary of Test Program and Objectives

A comprehensive initial test program was conducted at Seabrook Station to demonstrate that plant systems, structures, and components performed in a manner that did not endanger the health and safety of the public. The principle objectives of this program are to provide, to the extent practical, assurance of the following:

a. The plant has been properly designed and constructed and is capable of operating safely at performance levels specified in the Updated FSAR

b. The plant operating and emergency procedures have been verified by trial use to be adequate

c. The plant operating and technical personnel are knowledgeable about the plant equipment and procedures and are prepared to operate the facility in a safe manner.

The initial test program included a preoperational test phase and an initial startup test phase. Preoperational testing consisted of individual system and integrated system tests performed prior to (and in some cases after) initial core load on essentially completed systems and structures. These tests demonstrated, to the extent practical, the capability of systems, structures, and components to meet performance requirements.

Initial startup testing consisted of those single and multi-system activities scheduled to be performed during and following fuel loading. This included precritical tests, initial criticality, low-power tests, and power ascension tests. This testing demonstrated that the plant will operate in accordance with design and the ability of the plant to respond properly to anticipated transients.

14.2.2 Organization and Staffing

The Startup Test Department managed and provided overall direction for the initial program. The Startup Test Department consisted of personnel assigned to the plant site with specialties in areas such as primary systems, secondary systems, electrical systems, and plant operations. These individuals were assigned overall responsibility for various aspects of the test program within their areas of expertise. During the performance of system preoperational tests and initial startup tests, the Startup Test Department personnel directed plant operations personnel during test activities and were responsible for the acquisition, review and evaluation of relevant data.

Table 14.2-1 is a responsibility/authority matrix showing the various organizations involved with each portion of the Seabrook initial test program.

A definition of each of the major responsibilities is provided to clarify its specific intent. This table also presents the organizations responsible for the preparation, review and approval of Preoperational, Acceptance, Startup and Special Test procedures. The responsible design organizations or vendors provided technical support, as requested by their respective onsite organizations, and either reviewed or specified the acceptance criteria used in these test procedures. The interrelationship of the various organizations during testing activities is discussed in Subsections 14.2.4 and 14.2.5.

To ensure a comprehensive overview of the preoperational test program by the appropriate organizations, a Joint Test Group (JTG) was formed consisting of site representatives of the Startup Test Department, Seabrook Station Operations Staff, and the Nuclear Services Division (YNSD) of Yankee Atomic Electric Company (YAEC). The Startup Manager acted as chairman of the Joint Test Group and had final responsibility for approval of test procedures and test results. When necessary, personnel from other organizations were invited to attend the meetings of the JTG for information, coordination, or technical advice. The Nuclear Steam Supply System vendor (Westinghouse), the Architect-Engineer (UE&C), and Construction Manager (UE&C) provided technical assistance in their areas of specialty as required throughout the test program.

The JTG was responsible for the following activities:

a. Review and approval of preoperational test procedures

b. Review and approval of changes to preoperational test procedures

c. Review and approval of the results of preoperational tests.

At the time of the start of initial fuel loading, the JTG was dissolved and the Station Operations Review Committee (SORC) assumed the responsibilities stated above during the initial startup testing. During this portion of the program, the appropriate vendor and design organizations provided technical assistance during the initial procedure technical review by the Startup Test Department.

All personnel authorized to direct testing during the test program and to approve the procedures used in these tests were appropriately qualified in accordance with the requirements of Regulatory Guide 1.58 (Revision 1, 9/80) as further clarified in Section 1.8. Personnel authorized to direct preoperational and startup tests (Phases 2 through 6) also met the additional requirements of a Bachelor's Degree in Engineering or related science with a minimum of one year's experience acquired in testing, operation, and maintenance of nuclear power generating facilities for the direction of preoperational tests and a minimum of two years' experience for the direction of startup tests. For personnel who did not possess the formal education, this requirement was waived if other factors provided sufficient demonstration of ability. Personnel assigned to the Startup Test Department also received additional training in the administration and requirements of the test program. The qualifications of the station operating and technical staff are discussed in Section 13.1.

14.2.3 Test Procedures

The initial test program was conducted using written procedures for each individual test. Tests of systems and equipment performed prior to (or in some cases after) initial core load are designated as either Preoperational Tests (PT) or Acceptance Tests (AT). Preoperational Tests are subdivided into either of the following categories:

a. Individual systems tests demonstrate the proper operation of plant systems and equipment which perform a safety-related function.

b. Integrated systems tests involve the integrated operation of plant systems and equipment to demonstrate or verify a safety-related function.

Acceptance Tests demonstrated the proper operation of nonsafety-related plant systems and equipment.

Tests performed as part of or subsequent to loading of fuel into the reactor core were designated as Startup Tests (ST). In addition, Special Test Procedures (STP) not in the original scope of the test program were used for situations that required the performance of a test for investigative or data collection purposes.

Each test specified above contained as a minimum, the following sections:

a. Test Objectives

b. Prerequisites

c. Special Precautions

d. Initial Conditions (including environmental)

e. Test Instructions

f. Final Conditions

g. Acceptance Criteria.

The Test Instructions section of the test provided data blanks or reference data sheets which specifically identified the data recorded in each test. Means were provided to identify the individuals who witness or record data during each test and the instrumentation used for data collection. Administrative procedures were provided to specify proper methods for collection and retention of test data.

Table 14.2-1 shows the organizations responsible for the preparation, review and approval of Preoperational, Acceptance, Startup and Special Test procedures. The responsible design organizations or vendors provided technical support, as requested by their respective onsite organizations, and either reviewed or specified the acceptance criteria used in these test procedures.

14.2.4 Conduct of the Test Program

The preoperational test program was administered in accordance with the Preoperational Test Program Description which was prepared by the Startup Test Department and approved by the Joint Test Group participating organizations. Where necessary, due to certain unique activities associated with testing, administrative procedures were prepared by the Startup Test Department, reviewed by the Joint Test Group, and the Startup Manager had final responsibility for approval. Otherwise, station administrative procedures were used as applicable during the initial test program.

The initial startup program was administered in accordance with a startup procedure which was prepared by the Startup Test Department and approved by the Station Operations Review Committee, with the Station Manager having final approval responsibility. Normal station administrative procedures were used during the initial startup program.

Prior to the performance of a system preoperational or acceptance test, a test engineer (or engineers) was assigned by the Startup Test Department to direct the test. For startup tests, Startup Test Department engineers or appropriately qualified station staff technical personnel were assigned test director responsibility. These individuals were responsible for ensuring that prerequisites were completed, precautions complied with and initial conditions established. They then directed the station operating personnel in the performance of the test and assured all applicable data was recorded. Station operating personnel were responsible for the safe and proper operation of the plant and its associated equipment throughout the test program. The Shift Supervisor took whatever action necessary including, but not limited to, stopping any test and placing plant equipment in a safe condition.

All field changes to preoperational and acceptance test procedures were approved by the Shift Test Director prior to performance. The JTG reviewed all such field changes within fourteen days of implementation. All changes to startup test procedures were approved in accordance with Technical Specification requirements.

All plant modifications which were initiated as a result of system pre-operational or acceptance tests were controlled in accordance with the procedure for modifications during plant construction. Any such modifications or repairs were retested to the requirements of the test procedure. Subsequent to the completion of the system preoperational test, all modifications or repair activities were performed and retested in accordance with the normal station administrative procedures for modifications or maintenance as applicable.

14.2.5 Review, Evaluation and Approval of Test Results

Upon completion of each preoperational, acceptance, or startup test, the responsible test engineers reviewed the test data for completeness, performed any evaluations or calculations required, and compared the results to the stated acceptance criteria. Any unresolved or incomplete items, including acceptance criteria, were described on a summary list of test exceptions. The test results then were submitted to the Joint Test Group or Station Operations Review Committee, as applicable, for test result review. Upon satisfactory review by the Joint Test Group or Station Operations Review Committee, the test results were approved by the Startup Manager or the Station Manager.

Prior to the start of fuel loading, a final review was made by the Joint Test Group of the preoperational test program to ensure all required preoperational and acceptance tests were conducted and test results approved.

If during the course of the preoperational test program, it was necessary to delay a portion of a preoperational test, such tests were incorporated into the startup test program if adequate justification was present for delaying the test beyond core load. At this time, only AT-17, waste solidification system test, may be performed subsequent to core loading. This may be required if a permanent Waste Solidification System is not designed and installed at the time of fuel loading. This system was tested subsequent to installation independent of the startup program.

Prior to the start of each major phase of the initial startup program identified in Table 14.2-2, the Station Operations Review Committee performed a preliminary review of all prerequisite testing to ensure that it was satisfactorily completed to the extent necessary to perform the next phase of the startup program. The committee used a prerequisite list which was approved prior to the start of any test in the subsequent phase of testing.

14.2.6 Test Records

A copy of all Preoperational Tests, Acceptance Tests, Startup Tests, Special Test Procedures, and all relevant data recorded during the conduct of the tests will be maintained for the life of the station in accordance with station procedures for record retention.

14.2.7 Conformance of Test Programs with Regulatory Guides

The Regulatory Guides listed below were followed, to the degree indicated, during the conduct of the Seabrook Station initial test program.

Regulatory Guide 1.8, Rev. 1-R
Personnel Selection and Training

The initial personnel selection and training program met the requirements of Regulatory Guide 1.8 (1977 edition). For current status, see Sections 13.1 and 13.2.

Regulatory Guide 1.20, Rev.2
Comprehensive Vibration Assessment Program for Reactor Internals During Preoperational and Initial Startup Testing

The Westinghouse position on Regulatory Guide 1.20, Rev. 2, is discussed in Subsection 3.9(N).2.4.

Regulatory Guide 1.33, Rev. 2
Quality Assurance Program Requirements (Operation)

The quality assurance program for operation complies with the requirements of this Regulatory Guide. For further discussion, see Section 17.2.

Regulatory Guide 1.41, Rev. 0
Preoperational Testing of Redundant Electric Power Systems to Verify Proper Load Group Assessments

Seabrook Station conforms with the recommendations of Regulatory Guide 1.41.

Regulatory Guide 1.52, Rev.2
Design, Testing and Maintenance Criteria for Engineered Safety Feature Atmosphere Cleanup System Air Filtration and Absorption Units of Light Water Cooled Nuclear Power Plants

A detailed discussion on the degree of conformance to Regulatory Guide 1.52 is found in Subsection 6.5.1.

Regulatory Guide 1.68, Rev. 2
Initial Test Programs for Water-Cooled Nuclear Power Plants

The initial test program for Seabrook Station was conducted in accordance with the intent of Regulatory Guide 1.68 except for the items specified below:

a. During the preoperational test program, no practical method existed to vary system voltage to obtain maximum and minimum design voltages. The intent of the requirement to demonstrate that the emergency loads can start and operate with the maximum and minimum design voltage available was met by testing the emergency loads under plant light load conditions to simulate the maximum practically obtainable voltage and under plant heavy load conditions to simulate the minimum practically obtainable voltage. The results of this testing were compared to the station voltage study to verify the adequacy of the analytical model (Appendix A, Subsection 1.g.2).

b. During the power ascension testing phase, tests were scheduled so that the safety of the plant was not dependent on the performance of an untested system or feature. Power ascension testing was performed at power plateaus of approximately 30%, 50%, 75% and 100%. It was required that testing be performed at 30% rather than 25% because individual system stability is increased at 30% (e.g., Feedwater System). This allows comparison of steady-state conditions with the design at low power. Westinghouse-supplied plants have historically conducted tests at 30% and, therefore, generic data was available for review and comparison.

c. Throughout core loading and precritical tests, the shutdown margin was verified by periodic sampling of core coolant and verification that boron concentration was maintained at or above the Technical Specification concentration limit for refueling conditions (Appendix A, Section 2.a).

d. Control rod runback and partial scram features are not used in the Seabrook Station design and, therefore, were not tested during power escalation (Appendix A, Section 5.j).

e. A demonstration of the capability of systems and components to remove residual heat or decay heat from the Reactor Coolant System was performed during power ascension testing only if not performed during hot functional or low power tests (Appendix A, Section 5.1).

f. The failed fuel detection system is not applicable to the Seabrook design and, therefore, was not tested during power escalation (Appendix A, Section 5.q).

g. The integrated control system and the Reactor Coolant Flow Control System are not applicable to the Seabrook Station design and therefore, were not tested during power escalation. The Startup and Emergency Feedwater Control Systems and the Steam Pressure Control Systems are only used in the hot shutdown, hot standby or low power operating modes. These systems cannot be tested during power ascension (Appendix A, Section 5.s).

h. A demonstration of the dynamic response of the plant to a loss of or bypassing of a feedwater heater(s) was not performed. As shown in Subsection 15.1.1, the transient resulting from the most severe case of feedwater temperature reduction initiated by a single failure or operator error is similar to, but of a lesser magnitude than the excessive load increase (load swing). The load swing test was performed at several major plateaus.

i. As shown in Subsections 15.2.3 and 15.2.4, dynamic response of the plant to a MSIV closure is bounded by the response of the plant to the turbine trip event. Plant response to a turbine trip was demonstrated during performance of ST-38, unit trip from 100 percent power (Appendix A, Subsection 5.m.m).

j. The ability of the movable incore neutron flux instrumentation to detect control rod misalignments was not performed. The excore neutron flux instrumentation is not designed to detect a local condition such as a misaligned RCCA, but rather a more global anomalous core condition. The movable incore flux instrumentation is not intended to specifically detect a misaligned control rod, but may be able to confirm an RCCA misalignment initially detected by the Rod Position Indication System. The individual Rod Position Indication System is the primary means for detecting RCCA misalignments. Since at 100 percent power the control rods are essentially withdrawn, individual rod worth is such that the ability of the movable incore instrumentation to detect a control rod misalignment is limited. The basis for this deletion is that the original requirement was imposed to demonstrate alternative instrumentation capabilities in detecting a misaligned control rod. With the advent of the Digital Rod Position Indication (DRPI) System, the need for accurate and sensitive alternative indications has been essentially eliminated. In any case, the distribution and number of the incore and excore flux instrumentation has not been changed and is identical to all Westinghouse four-loop plants since Indian Point 2. Since that time, the capability and sensitivity of the excore and incore flux instrumentation has been demonstrated numerous times (Appendix A, Section 5.1).

k. Vibration levels of the Reactor Coolant System and piping reaction to transient conditions are measured during hot functional testing (Appendix A.2.f).

l. Evaluation of rod scram times for scrams that occur during power ascension was not performed since no practical method for obtaining this data exists for a Westinghouse PWR (Appendix A, Section 5.h).

m. The static rod drop test was not performed at Seabrook. Performance of this test at other facilities has resulted in abnormally high power tilts and large xenon oscillations and may increase the risk of fuel failure. Performance of this test at plants similar to Seabrook has provided ample data to demonstrate that Westinghouse computer codes are able to adequately predict core thermal and nuclear parameters for RCCA misalignments up to and including full insertion of a single high worth rod. In addition, following performance of this test at Catawba, INPO has recommended that utilities delete this test from their startup programs (Appendix A, Section 5.f).

n. The pseudo-rod ejection test was not performed at greater than 10% power at Seabrook. Performance of this test may result in violation of the Technical Specification limits on peaking factor. Since the accident analysis for Seabrook shows the at-power ejected rod worth and power peaking factors are bounded by the zero power case, the calculation model was verified during the pseudo-rod-ejection test at zero power (Appendix A, Section 5.e).

o. Control rod scram times were measured at hot full-flow conditions only. Testing at no-flow conditions would require unnecessary and undesirable cycling of the reactor coolant pumps to be in compliance with the Technical Specifications. In addition, the hot full-flow condition is the limiting condition required by Technical Specifications (Appendix A, Section 2.b).

Regulatory Guide 1.79, Rev.1
Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors

The initial test program for Seabrook Station was conducted in accordance with the intent of Regulatory Guide 1.79 except for the following:

a. Subsection C.1.c.(2) specifies that an opening test of the accumulator isolation valves be performed at the maximum differential pressure that the valve will experience using both normal and emergency power supplies. Since the valve operational capability is independent of the source of power and the valve motors are a small fraction of the rating of the emergency power supply, the valves were cycled at maximum differential pressure using the normal power supply only.

b. Subsection C.1.a.(2) specifies that a flow test at hot operating conditions be initiated by actuation of the safety injection signal. Since the intent of the test is to verify the ability to deliver cooling water to the vessel under simulated accident conditions, manual actuation of pump operation is considered sufficient to initiate the system and will permit rapid termination of the injection to minimize thermal shock effects. If a safety injection actuation signal is used, the pumps cannot be readily de-energized due to circuit time delays, resulting in a greater thermal shock to the primary system. Integrated system response to an actuation signal was demonstrated in other tests.

Regulatory Guide 1.80, Rev. 0
Preoperational Testing of Instrument Air Systems

The initial test program for Seabrook Station was conducted in accordance with the intent of Regulatory Guide 1.80 except for the following:

a. The loss-of-instrument-air supply test described in Sections C.8, C.9 and C.10 was performed only on the portion of the Instrument Air System which performs a safety-related function and uses instrument air in the performance of that function.

b. Section C.11 requires that the results of preoperational testing of the instrument air system be included in the startup report. This requirement is in conflict with the reporting requirements of Section C.9 of Regulatory Guide 1.68, Rev. 2. The guidelines contained in Regulatory Guide 1.68 were followed for handling the results of the instrument air preoperational testing.

Regulatory Guide 1.108, Rev. 1
Periodic Testing of Diesel Generators Used as Onsite Electric Power Systems at Nuclear Power Plants

Seabrook Station is generally in conformance with Regulatory Guide 1.108.

The detailed discussion on this guide is found in Section 1.8.

Regulatory Guide 1.128, Rev. 1
Installation Design and Installation of Large Storage Batteries for Nuclear Power Plants

Seabrook Station is generally in conformance with Regulatory Guide 1.128.

The detailed discussion on this guide is found in Subsections 8.3.2 and 8.3.3.

Regulatory Guide 1.140, Rev. 1
Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light Water-Cooled Nuclear Power Plants

A discussion of the degree of conformance to this regulatory guide is found in Section 1.8. Initial testing of the applicable filtration systems was in accordance with the recommendations contained in this regulatory guide.

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

The Startup Test Department performed a survey of PWR operating experiences, encompassing approximately similar power plants over at least the two previous years. The survey identified operating problem areas or categories of abnormal occurrences that are repeatedly being experienced by other facilities. This information was incorporated appropriately into the Seabrook Startup Program.

14.2.9 Trial Use of Plant Operating and Emergency Procedures

The procedures used to conduct the preoperational test program referenced the station operating, emergency and surveillance procedures whenever possible. During initial startup, plant operating and emergency procedures were used almost exclusively to operate the plant and its systems. Whenever corrections to station procedures were identified during testing, the corrections were evaluated and the procedures revised accordingly.

A description of station procedures is provided in Section 13.5.

14.2.10 Initial Fuel Loading and Initial Criticality

The following describes the general approach used to prepare for and perform initial fuel loading and initial criticality. Detailed procedures prepared and approved in accordance with Table 14.2-1 governed the actual work activities.

14.2.10.1 Initial Fuel Loading

Initial fuel loading did not begin until all prerequisite system tests and operations were completed to the satisfaction of the Station Operations Review Committee.

Fuel handling tools and equipment were checked out and dry runs conducted in the use and operation of the tools and equipment.

The containment integrity was established as required by Station Technical Specifications for the refueling mode.

The reactor vessel and associated components were ready to receive fuel. Water level was maintained above the bottom of the nozzles and recirculation maintained to assure a uniform boron concentration. Boron concentration can be increased via emergency boration or the addition of borated water directly to the open vessel. The refueling cavity remained dry during initial fuel loading activities.

The overall responsibility and direction for initial fuel loading was exercised by the station staff. The loading was directly supervised by a Senior Licensed Operator having no concurrent duties. The process was directed from the operating floor of the containment structure. Procedures for the control of personnel access and the maintenance of containment security were established prior to fuel loading.

The as-loaded core configuration is specified as part of the core design studies conducted in advance and is not expected to change. In the event that mechanical damage occurs to a fuel assembly and no spare is available onsite, an alternate core loading scheme whose characteristics closely approximate that of the initially prescribed pattern will be determined.

The core was assembled in the reactor vessel. The fuel assemblies were submerged in reactor grade water containing enough dissolved boric acid to maintain a calculated core effective multiplication factor within Technical Specification limits. Core moderator chemistry conditions (particularly boron concentration) were prescribed in the core loading procedure and were verified at a specified frequency by chemistry sample and analysis.

Core loading instrumentation consists of two permanently installed source range (pulse type) channels and two temporary incore source range channels. A third temporary channel may also be used as a spare. The temporary channels are monitored in the containment structure. Both permanent channels can display the neutron flux level on a strip chart recorder. One permanent channel is also equipped with an audible count rate indicator; the temporary channels indicate on scalers with a minimum of one channel recorded on a strip chart recorder. Minimum count rates of one-half count per second, attributable to core neutrons, are required on at least two of the four available source range channels at all times following installation of the initial nucleus of eight fuel assemblies. A response check of the source range channels to a neutron source was performed within eight hours prior to the start of core loading (or resumption of loading if delayed for more than eight hours).

At least two artificial neutron sources were introduced into the core at appropriate specified points in the core loading program to ensure a detector response of at least one-half count per second attributable to neutrons.

Fuel assemblies, together with inserted components (control rod assemblies, burnable poison assemblies, neutron source assemblies, or thimble plugging devices), were placed in the reactor vessel one-at-a-time according to a previously approved sequence which was developed to provide reliable core monitoring during fuel loading activities. The core loading procedure documents included check sheets which specified and verified the sequential movement of each fuel assembly from its initial position in the storage racks to its final position in the core. Multiple checks were made of component serial numbers and types to guard against possible inadvertent exchanges or substitutions of components. Visual inspections were made to verify proper seating and orientation of fuel assemblies and components. Fuel assembly status boards were maintained throughout the core loading operation.

An initial nucleus of eight fuel assemblies, one of which contains a neutron source, is considered the minimum source-fuel nucleus which permits meaningful inverse count rate monitoring. This initial nucleus is determined by calculation to be markedly subcritical under the conditions of loading.

Each subsequent fuel addition is accompanied by neutron count rate monitoring to determine that the just-loaded fuel assembly does not excessively increase the count rate and that the extrapolated inverse count rate ratio is not decreasing for unexplained reasons. The results of each loading step were evaluated before the next sequential step was started. The final, as-loaded, core configuration was subcritical ($k_{eff} \leq 0.95$) under the required loading conditions.

Criteria for safe loading require that loading operations stop immediately if any of the below conditions exist:

a. An unanticipated increase in the neutron count rates by a factor of 2 occurs on all responding nuclear channels during any single loading step after the initial nucleus of eight fuel assemblies are loaded

b. An unanticipated increase in the count rate by a factor of 5 occurs on any individual responding nuclear channel during any single loading step after the initial nucleus of eight fuel assemblies are loaded

c. An unexplained decrease in boron concentration greater than 20 ppm from nominal as determined from samples of reactor coolant water.

An alarm in the Containment and control room is connected to the source range channels with an alarm setpoint equal to or less than five times the current count rate. This alarm automatically alerts the personnel performing loading operations that a high count rate condition exists and requires an immediate stop of all operations until the condition is evaluated. If the alarm is actuated during core loading, preselected personnel are permitted to remain in the Containment to evaluate the cause and determine further action.

In addition to the above, fuel loading procedures specify the condition of fluid systems to prevent inadvertent dilution of the reactor coolant boron concentration; define the means of fuel movement and handling to prevent the possibility of mechanical damage; define the criteria for stopping fuel loading, containment evacuation, and emergency boration; define the conditions that must exist for fuel loading to proceed; define responsibility and authority of personnel involved in the operation; and provide for fuel and core component accountability and status.

14.2.10.2 Initial Criticality

Upon completion of fuel loading, the reactor upper internals and the pressure vessel head were installed. Mechanical and electrical tests were performed on the control rod drive mechanisms. These tests included a complete operational checkout of the mechanisms and calibration of the individual Rod Position Indication System.

Tests are performed on the reactor trip circuits to verify manual trip operation of control assemblies. The control assembly drop times are measured for each control rod assembly at hot full flow conditions.

During control rod drive mechanism testing, the boron concentration in the coolant-moderator is maintained so that the shutdown margin requirements specified in the Technical Specifications are met. During individual control assembly or control bank movement, source range instrumentation is monitored for unexpected changes in core reactivity. A functional check is made of the moveable Incore Detector System and a leak test of the Reactor Coolant System is performed. Just prior to the approach to criticality, a functional test of the nuclear instrumentation is conducted, including verification that the high flux scram setpoint is set at a low value.

Initial criticality was achieved with the reactor at normal operating temperature and pressure by a combination of shutdown and control bank withdrawal and reactor coolant system boron reduction. Inverse count rate ratio monitoring, using data from the normal plant source range instruments, is used as an indication of the proximity and rate of approach to criticality. Inverse count rate ratio data are plotted as a function of rod bank position during rod motion and as a function of primary water addition during reactor coolant system boron concentration reduction.

Initially, the shutdown and control banks are withdrawn in the normal withdrawal sequence leaving the last withdrawn control bank inserted far enough in the core to provide effective control when criticality is achieved.

The boron concentration of the Reactor Coolant System is then reduced by the addition of primary water. Criticality is achieved during boron dilution or by subsequent rod withdrawal following boron dilution. The rate of primary water addition and, therefore, the rate of approach to criticality may be reduced as the reactor approaches criticality to ensure that effective control is maintained. Throughout this period, samples of reactor coolant are obtained and analyzed for boron concentration.

Written procedures specify the plant conditions, precautions and specific instructions for the approach to criticality and for limiting the period to more than thirty seconds once criticality is achieved.

14.2.11 Test Program Schedule

The initial test program consisted of a preoperational test phase and a startup test phase. The preoperational phase of testing of individual plant systems began after construction of the system was essentially complete and construction verification tests (hydrostatic tests, control circuits checks, etc.), system flushing, and preliminary system operational checks (instrument calibration, pump and motor operation, valve checks, etc.) were completed. Each system preoperational or acceptance test demonstrated, to the extent practical, the ability of the system and equipment to perform its design function in accordance with the Updated FSAR requirements.

The individual system preoperational and acceptance tests proceeded concurrently as individual system construction and preliminary testing was completed. When the appropriate systems were turned over to the station staff, integrated system preoperational tests were performed. The principal milestones during this phase of the program were the reactor vessel hydrostatic test and integrated hot functional tests. Tests of other systems were scheduled as appropriate to support these events. Subsection 14.2.12 provides more detailed information on each test performed during the preoperational phase of the program.

The startup test phase commenced at initial fuel loading. Initial fuel loading and initial criticality are discussed in Subsection 14.2.10. Subsequent to initial criticality, low power reactor physics tests were performed. During these tests, measurements were performed to verify the calculated values of control rod bank reactivity worths, isothermal temperature coefficients, and differential boron concentrations as a function of control rod configuration.

When the reactivity control characteristics of the reactor were verified by the low power tests, a program of power level escalation brought the unit to its full-rated power level. During the power escalation, pre-determined tests were conducted to verify that the reactor and unit perform as expected at 30%, 50%, 75% and 100% power. Tests were scheduled so that the safety of the plant was not dependent on the performance of an untested system or feature. Subsection 14.2.12 provides more detailed information on each test that was performed during low power testing and power escalation.

Test procedures used during the preoperational test phase were available for review by NRC regional personnel approximately 60 days prior to their use. Startup test procedures were available for review approximately 60 days prior to fuel load.

14.2.12 Individual Test Descriptions

Included in this section are test abstracts for individual tests which were conducted during the initial test program to verify the performance capabilities of structures, systems, and components that:

a. Are used for shutdown and cooldown of the reactor under normal plant conditions and for maintaining the reactor in a safe condition for an extended shutdown period

b. Are used for shutdown and cooldown of the reactor under transient (infrequent or moderately frequent events) conditions and postulated accident conditions and for maintaining the reactor in a safe condition for an extended shutdown period following such conditions

c. Are used for establishing conformance with safety limits or limiting conditions for operation that are included in the facility Technical Specifications

d. Are classified as Engineered Safety Features or that will be relied upon to support or ensure the operation of Engineered Safety Features within design limits

e. Are assumed to function, or for which credit is taken in the accident analysis of the facility, as described in the Updated FSAR

f. Are used to process, store, control, or limit the release of radioactive materials.

It is anticipated that changes may occur to these abstracts as the test program develops. As a result, tests or portions of tests described by particular abstracts may be combined or divided into smaller test segments when the detailed test procedures are written.

Table 14.2-3 provides an index of the Preoperational Tests (PT) performed on safety-related systems and equipment during the initial test program.

Table 14.2-4 provides an index of the Acceptance Tests (AT) performed on nonsafety-related systems and equipment during the initial test program.

Table 14.2-5 provides an index of the Startup Tests (ST) performed during the initial startup program.

SEABROOK STATION
UPDATED FINAL SAFETY ANALYSIS REPORT

CHAPTER 14
INITIAL TEST PROGRAM

TABLES

TABLE 14.2-1 INITIAL TEST PROGRAM RESPONSIBILITY/AUTHORITY MATRIX

Activity	Preoperational Test Program		Initial Startup Program		
	Individual System Tests	Integrated Systems Tests	Core Load	Criticality & Physics Tests	Power Escalation Tests
Test Program Management	STD	STD	STD	STD	STD
Test Procedure Preparation	STD	STD	STD or SS	STD or SS	STD or SS
Test Procedure Approval	JTG	JTG	STD, SORC	STD, SORC	STD, SORC
Test Coordination & Direction	STD	STD	STD or SS	STD or SS	STD or SS
Systems & Equipment Operations	STD or SS	SS	SS	SS	SS
Systems & Equipment Maintenance	STD or SS	SS	SS	SS	SS
Test Completion Approval	JTG	JTG	STD, SORC	STD, SORC	STD, SORC
Technical Support	NSD, NSS, AE, TG	NSD, NSS, AE, TG	NSD, NSS, AE	NSD, NSS, AE	NSD, NSS, AE, TG

Definitions

Test Program Management

"Test Program Management" defines the organization responsible for coordinating and sequencing of the initial test program activities.

Test Procedure Preparation

"Test Procedure Preparation" defines the organization responsible for preparation of the test procedure initial draft, coordination of the procedure review, and resolution of comments.

Test Procedure Approval

"Test Procedure Approval" defines the organization that will review and approve test procedures prior to their performance.

Test Coordination and Direction

"Test Coordination and Direction" defines the organization that will coordinate the activities prior to, during and after each test. A test director will insure that the test is properly conducted and all relevant data is properly recorded. Upon completion of the test, the data will be analyzed for completion review and approval.

Systems and Equipment Operations

"Systems and Equipment Operations" defines the organization responsible for the operation of the plant equipment during each phase of the test program.

System and Equipment Maintenance

"System and Equipment Maintenance" defines the organization responsible for the maintenance of plant equipment during each phase of the test program.

Test Completion Approval

"Test Completion Approval" defines the organizations that will review and approve the results of completed test procedures.

Definitions

Technical Support

"Technical Support" defines the offsite organizations that will be used to provide technical input for the initial test program, as required.

Legend:

STD Startup Test Department - New Hampshire Yankee

JTG Joint Test Group - JTG shall review, the Startup Manager shall approve.

NSS Nuclear Steam Supply Vendor - Westinghouse Electric Corporation

AE Architect-Engineer and Construction Manager - United Engineers & Constructors

SS Station Staff - New Hampshire Yankee

NSD Nuclear Services Division Yankee Atomic Electric Company

TG Turbine Generator Vendor General Electric Company

SORC Station Operations Review Committee - SORC shall review, the Station Manager shall approve.

TABLE 14.2-2 MAJOR ACTIVITIES REQUIRING STATION OPERATING REVIEW COMMITTEE APPROVAL PRIOR TO START

Fuel Loading

Initial Criticality

30% Power Ascension

50% Power Ascension

75% Power Ascension

100% Power Ascension

TABLE 14.2-3 PREOPERATIONAL TEST ABSTRACTS

Preoperational Test Abstracts

1. REACTOR COOLANT PUMPS

Objective

To verify proper operation of the reactor coolant pumps and to establish baseline data for pump operations.

Plant Conditions Prerequisites

Prior to and during hot functional testing.

Test Method

Instructions will be given specifying the required operations for the initial run of the reactor coolant pumps. Interlocks and controls will be tested. Pump operating data will be recorded. Additional operating data will be obtained during hot functional testing.

Acceptance Criteria

Reactor coolant pump controls and interlocks operate in accordance with the requirements of Updated FSAR Subsection 5.4.1, and baseline pump and motor data is collected.

Preoperational Test Abstracts

2. PRESSURIZER RELIEF TANK

Objective

To verify that the pressurizer relief tank provides adequate control of the discharges from the pressurizer relief valves.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

The operation of the pressurizer relief tank will be demonstrated by performing operability checks of the tank and associated instrumentation and auxiliary equipment. During hot functional tests, the ability of the system to receive and cooldown a discharge from the power-operated relief valves will be verified.

Acceptance Criteria

The pressurizer relief tank operates in accordance with the requirements of Updated FSAR Subsections 5.4.11.2 and 5.4.11.4.

Preoperational Test Abstracts

3. REACTOR COOLANT AND ASSOCIATED SYSTEMS PIPING VIBRATION TEST

Objective

To demonstrate that vibration levels in selected ASME Code Class 1, 2 and 3 systems, Seismic Category I systems, and other high energy piping systems located in Seismic Category I structures are acceptable.

Plant Conditions/Prerequisites

Prior to initial core loading. The specific conditions required for each system will be specified by the test procedure.

Test Method

Selected lines will be instrumented and the amplitude of the vibrations measured for various operational modes. Noninstrumented piping will be inspected during system operation to ensure vibration levels are within acceptable limits.

Acceptance Criteria

The reactor coolant and associated system piping vibration does not exceed the requirements of Section III of the ASME Code, paragraph NB-3622.3.

Preoperational Test Abstracts

4. REACTOR COOLANT AND ASSOCIATED SYSTEMS THERMAL EXPANSION AND RESTRAINT TEST

Objective

To verify that the reactor coolant and other selected plant systems are free to expand during plant heatup and contract during plant cooldown.

Plant Conditions/Prerequisites

During heatup and cooldown for hot functional testing. Preservice inspection has been completed for hydraulic snubbers.

Test Method

Baseline position data will be taken at selected points on components and piping at cold plant conditions. During heatup to normal operating temperatures, expansion data will be taken at specified temperature plateaus at these selected points. An inspection will be performed to detect any points of interference which will be corrected prior to continuing the heatup. Hydraulic snubbers will also be visually inspected during heatup and cooldown to demonstrate operability. Following the cooldown, a final check of piping and component baseline positions will be obtained.

Acceptance Criteria

During heatup and cooldown of the Reactor Coolant System, the system piping is free to expand and contract in accordance with Updated FSAR Subsection 3.9(B).2.1b.

Preoperational Test Abstracts

5. CVCS - CHARGING AND LETDOWN

Objective

To demonstrate the charging, letdown, boric acid transfer, and associated purification functions of the Chemical and Volume Control System (CVCS).

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Prior to hot functional tests, system components and their associated control systems will be operationally checked to the extent practical. During hot functional tests, the ability of the positive displacement pump and the centrifugal charging pumps to deliver water into the RCS will be demonstrated. The letdown capabilities will also be demonstrated and the various control systems will be operationally checked. Operations will be conducted to demonstrate the various modes of boration and dilution. The Boric Acid Transfer System will be functionally tested in its various operational modes. Operation of the purification system will be demonstrated by verification of flow and pressure drops across the demineralizers. Relevant system pressure, flow, and temperature data will be recorded.

Acceptance Criteria

The Chemical and Volume Control System charging and letdown operates in accordance with Updated FSAR Subsection 9.3.4.

Preoperational Test Abstracts

6. CVCS - BORON THERMAL REGENERATION SYSTEM

Objective

To demonstrate the operational capability of the Boron Thermal Regeneration System (BTRS).

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Prior to hot functional testing, system components will be operationally checked to the extent practical. During hot functional testing, the system will be operated in its various operational modes and relevant pressure, temperature and flow data recorded.

Acceptance Criteria

The Boron Thermal Regeneration System operates in accordance with the requirements of Updated FSAR Subsection 9.3.4.2d.

Preoperational Test Abstracts

7. RESIDUAL HEAT REMOVAL SYSTEM

Objective

To demonstrate the operational capability of the Residual Heat Removal System, and to establish baseline data for pump operation.

Plant Conditions/Prerequisites

Prior to hot functional testing.

Test Methods

The Residual Heat Removal (RHR) System will be tested to verify controls and interlocks and to determine system operating characteristics. Operability of relief valves will be verified. Additional testing will be performed during the integrated plant cooldown from hot functional tests.

Acceptance Criteria

The Residual Heat Removal System operates in accordance with the requirements of Updated FSAR Subsection 5.4.7.

Preoperational Test Abstracts

8. ECCS PERFORMANCE TEST

Objective

To demonstrate the capability of the Emergency Core Cooling Systems to pump water from the refueling water storage tank into the reactor vessel through various combinations of pumps and injection lines.

Plant Conditions/Prerequisites

Prior to initial core loading with the reactor vessel open.

Test Method

A series of flow tests will be run using the centrifugal charging pumps, safety injection pumps, and RHR pumps to verify proper flow rates and to perform any required flow balancing during pumping from the RWST to the reactor vessel. The draw-down characteristics of the RWST and SAT will be demonstrated during these operations. Appropriate data will be obtained to determine pump headflow characteristics. The ability of the RHR pumps to supply water to the SI and the centrifugal charging pumps will be demonstrated. The operability of the RWST and the SAT (ECCS water sources) will be demonstrated.

Margin between pump motor current trip points and current values at full design flow conditions will be demonstrated.

Acceptance Criteria

The Emergency Core Cooling System operates in accordance with the requirements of Updated FSAR Subsection 6.3.2.1.

Preoperational Test Abstracts

9. ECCS HOT FUNCTIONAL TEST

Objective

To demonstrate the capability of the Emergency Core Cooling Systems to pump into the Reactor Coolant System at operating conditions, and to verify that the accumulator check valves operate properly at higher temperatures.

Plant Conditions/Prerequisites

During hot functional testing and during cooldown from hot functional testing.

Test Method

Water from the RWST will be injected into the Reactor Coolant System utilizing the centrifugal CVCS pumps to the extent necessary to verify check valve operation and to obtain rated pump flow. The duration of injection will be limited to minimize thermal shock effects. During the cooldown from hot functional tests, this test will be performed using the safety injection pumps and the accumulators. Following each injection, the ability of the check valves to reseat will be verified.

Acceptance Criteria

Emergency core cooling water is injected into the - primary system by each subsystem at its design operating limit in accordance with the Updated FSAR Subsection 6.3.2.1.

The associated system check valves are tested for leakage in accordance with Technical Specification 4.0.5.

Preoperational Test Abstracts

10. SAFETY INJECTION ACCUMULATOR BLOWDOWN TEST

Objective

To demonstrate proper system actuation and flow rate for the test conditions, and to demonstrate isolation valve operability.

Plant Conditions/Prerequisites

Prior to initial core loading with the reactor vessel open.

Test Method

The accumulators will be filled to their normal operating level and pressurized to a specified pressure. The accumulators will be discharged one at a time into the vessel and data will be collected to determine the rate of discharge. The accumulators will again be filled and pressurized to the maximum expected accumulator precharge pressure. The accumulator isolation valves will be opened under the maximum differential pressure condition.

Acceptance Criteria

Safety injection accumulator response is in accordance with the Updated FSAR Section 6.3 design requirements, and the isolation valves are capable of opening with maximum cover pressure specified in Technical Specification 3.5.1.

Preoperational Test Abstracts

11. CONTAINMENT RECIRCULATION SUMP OPERABILITY DEMONSTRATION

Objective

To verify the operability of the ECCS sump.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

The ECCS sump will be filled. An RHR and a containment spray pump will be operated at post-LOCA recirculation flow rates and recirculated back to the sump. Appropriate pressure and flow data will be recorded to verify net positive suction head characteristics.

Acceptance Criteria

The containment building sump provides fluid suction pressure greater than the net positive suction head required (as specified in the certified pump curves) to the RHR and CBS pumps at post-LOCA conditions.

Preoperational Test Abstracts

12. CONTAINMENT SPRAY SYSTEM

Objective

To verify the proper operation of the Containment Spray System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Tests will be performed to verify proper operation of all containment spray system components and to determine pump head-flow characteristics. Air flow tests of the containment spray nozzles will verify that the nozzles are not plugged.

Tests will be performed to verify proper operation of the Refueling Water Storage Tank (RWST) Heating System.

Acceptance Criteria

The Containment Spray System operates in accordance with safety analysis requirements of Updated FSAR Subsection 6.2.2.2.

Preoperational Test Abstracts

13. MAIN STEAM LINE ISOLATION VALVES

Objective

To verify proper operation of the main steam line isolation valves.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Operation of the main steam line isolation and bypass valves will be demonstrated at cold plant conditions including the response to a main steam line isolation signal. During hot functional tests, valve operation will be demonstrated and the closure time measured.

Acceptance Criteria

The Main Steam Line Isolation System operates in accordance with the requirements of the Updated FSAR Subsection 5.4.5 and valve closure times meet Updated FSAR Table 16.3-4 requirements for main steam isolation valves and main steam isolation valve bypass valves.

Preoperational Test Abstracts

14. EMERGENCY FEEDWATER SYSTEM

Objective

To demonstrate proper operation of the Emergency Feedwater System.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Prior to hot functional tests, emergency feedwater pump and feedwater isolation valve control and operability checks will be performed to the extent practical.

During hot functional tests, each emergency feedwater pump will be operated to verify pump bead-flow characteristics and to demonstrate the capability to feed the steam generators while at pressure. System response to ESF actuation signals, including the operation of the feedwater isolation valves, will be demonstrated.

A 48-hour endurance run and subsequent restart will be performed on each emergency feedwater pump to demonstrate long-term reliability.

At least five consecutive, successful, cold, pump starts for each emergency feedwater pump will be demonstrated.

Steam generator feeding capabilities using the Emergency Feedwater System under a simulated loss of offsite and onsite AC power condition will be demonstrated.

A flow instability test will be performed to demonstrate a "water hammer" will not occur in system components, piping, or inside the steam generators during normal system startup and operation.

The operation of the associated ventilation system will be verified during this test.

The operation of the condensate storage system will be demonstrated.

Preoperational Test Abstracts

14. EMERGENCY FEEDWATER SYSTEM (Continued)

Acceptance Criteria

The Emergency Feedwater System operates in accordance with the requirements of Updated FSAR Section 6.8.

The emergency feedwater pump can operate for the 48-hour endurance run with a subsequent restart without exceeding the operational limitations listed in the plant operating procedures.

Feedwater isolation valve closure times meet the requirements noted in the Technical Requirements Manual.

Steam generator feeding capabilities under a simulated loss of offsite and onsite AC power condition is demonstrated.

Preoperational Test Abstracts

15. SERVICE WATER SYSTEM

Objective

To demonstrate the proper operation of the Service Water System.

Plant Conditions/Prerequisites

During hot functional testing, and prior to initial core load.

Test Method

During hot functional testing, the ability to maintain required component temperatures will be verified. Cooling tower performance will be verified by a combination of air flow tests and capability analysis. Prior to initial core load, control system functional tests will be performed. Pump and overall system performance data will be obtained using both the ocean and the cooling tower as the source of cooling water. The operation of the associated ventilation systems for the Service Water Pumphouse and Cooling Tower will be demonstrated.

The overflow is not tested because of the potential to undermine paving and wash out earthen fill. System design calculations were bench-marked against actual test data so that the calculated flow out the overflow is valid.

Acceptance Criteria

The Service Water System operates in accordance with the requirements of the Updated FSAR Subsections 9.2.1 and 9.2.5.

Each system flow train supplies cooling water to both safety and nonsafety-related loops in the normal plant configuration and to safety-related loops in the accident configuration utilizing either the ocean or cooling tower.

The cooling tower performance test results demonstrate the dissipation of the heat loads specified in Table 9.2-13 of the Updated FSAR.

Cooling tower makeup water equipment meets Updated FSAR Subsection 9.2.5.3c criteria.

Preoperational Test Abstracts

16. PRIMARY COMPONENT COOLING WATER SYSTEM

Objective

To demonstrate the proper operation of the PCCW System.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Prior to hot functional testing, system component operability checks and control system functional tests will be performed. During hot functional tests, data will be taken to verify that adequate cooling is being provided to PCCW components.

Acceptance Criteria

The Primary Component Cooling Water System operates in accordance with the requirements of the Updated FSAR Subsection 9.2.2.

The system supplies cooling water to both the safety and nonsafety-related loops in the normal plant configuration and to safety-related loops in the accident configuration.

Preoperational Test Abstracts

17. SPENT FUEL POOL COOLING SYSTEM

Objective

To demonstrate the proper operation of the Spent Fuel Pool Cooling System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Spent fuel pool cooling and cleanup system equipment operability checks, flow verification tests and control system functional tests will be performed in the various system operational modes to demonstrate proper system performance.

Antisyphon devices, high radiation alarms, and low water level alarms will be demonstrated.

Leak tests of sectionalizing devices will be demonstrated operable.

Acceptance Criteria

The Spent Fuel Pool Cooling System operates in accordance with the requirements of Updated FSAR Subsection 9.1.3.

Normal and alternate system design flow paths are demonstrated.

Preoperational Test Abstracts

18. EXCORE NUCLEAR INSTRUMENTATION

Objective

To verify the calibration of the excore nuclear instrumentation.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

The excore nuclear instrument channels will be calibrated and functionally checked to verify alarm and trip setpoints and the operation of auxiliary equipment. The response of the source range detectors to a neutron source will be verified.

Acceptance Criteria

The reactor trip setpoints and interlocks generated by the Nuclear Instrumentation System have been verified at the values specified in the Technical Specifications Table 2.2-1.

The control and indication functions of the Nuclear Instrumentation System have been demonstrated to be in accordance with the Updated FSAR Section 7.2. The overall time-response of the nuclear instrumentation channels has been demonstrated at the values specified in Updated FSAR Table 16.3-1.

Preoperational Test Abstracts

19. REACTOR PROTECTION SYSTEM AND ENGINEERED SAFETY FEATURES

Objective

To verify proper operation and response time of the Reactor Protection System and the engineered safety features (ESF) actuation logic.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

The operation of the Reactor Protection System will be verified for all conditions of logic using outputs or simulated outputs from each of the RPS sensors through to tripping of the reactor trip breakers. Individual protection channels will be tested to check design redundancy and to demonstrate safe failure on loss of power.

The Reactor Trip System response time shall be the time interval from when the monitored parameter exceeds its trip setpoint at the channel sensor until loss of stationary gripper coil voltage.

The operation of the ESF logic will be verified for all modes of operation using outputs or simulated outputs from each of the sensors through to the output of the slave relays. Individual ESF channels will be tested to verify design redundancy. The response time of required ESF signals will be determined from the sensor output to equipment actuation.

Acceptance Criteria

The Reactor Protection System has been verified to operate in accordance with the design requirements dictated by Updated FSAR Section 7.2.

The reactor protection time response has been verified to meet the requirements specified in Updated FSAR Table 16.3-1. All reactor protection system trip setpoints and interlocks have been demonstrated at the values specified in Technical Specifications Table 2.2-1.

The engineered safety features have been demonstrated to operate in accordance with the design requirements of Updated FSAR Section 7.3. The engineered safety features time response has been verified to meet the requirements specified by Updated FSAR Table 16.3-2.

Preoperational Test Abstracts

21. PRIMARY CONTAINMENT ISOLATION VALVES

Objective

To verify that the primary containment isolation valves respond properly to their respective isolation signals.

Plant Conditions/Prerequisites

Prior to primary containment leak rate test.

Test Method

Primary containment isolation valve controls and interlocks will be tested to verify the following:

a. That on a Phase A containment isolation test signal, each Phase A isolation valve actuates to its isolation position.

b. That on a Phase B containment isolation test signal, each Phase B isolation valve actuates to its isolation position.

c. That on a containment purge and exhaust isolation test signal, each purge and exhaust valve actuates to its isolation position.

d. That on a feedwater isolation test signal, each feedwater isolation valve actuates to its isolation position.

e. That the isolation time of each automatic containment isolation valve is within its limit.

Acceptance Criteria

The primary containment isolation valves operate in accordance with safety analysis requirements for "Containment Isolation System," Updated FSAR Subsection 6.2.4.

Preoperational Test Abstracts

22. CONTAINMENT ENCLOSURE VENTILATION SYSTEMS

Objective

To demonstrate proper operation of the Containment Enclosure Ventilation Systems.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Containment enclosure ventilation operability tests, and air flow verification checks will be performed prior to and during hot functional testing. Data will be recorded, during hot functional testing, to verify that area temperatures are satisfactory.

Acceptance Criteria

Satisfactory demonstration of equipment to maintain area temperatures per design, as stated in Updated FSAR Subsection 9.4.6.

Preoperational Test Abstracts

23. CONTAINMENT ENCLOSURE EXHAUST SYSTEM

Objective

To demonstrate proper operation of the Containment Enclosure Exhaust System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Containment enclosure exhaust equipment operability checks and control system functional tests will be performed to verify their ability to:

a. Provide isolation from Primary Auxiliary Building "normal exhaust system," switching to emergency exhaust air cleaning mode following a LOCA.

b. Maintain negative pressure within containment enclosure areas with respect to the outside by the Containment Enclosure Exhaust Filter System.

Containment enclosure filters will be installed.

In-place filter verification testing will be conducted to satisfy Regulatory Guide 1.52. This testing will be performed in Item 44.

Acceptance Criteria

Containment enclosure exhaust system operational performance tests satisfy design criteria, as described in Updated FSAR Subsections 6.5.1 and 9.4.6.

Preoperational Test Abstracts

24. CONTAINMENT ENCLOSURE LEAK RATE TEST

Objective

To demonstrate the containment enclosure leakage is less than design.

Plant Conditions/Prerequisites

Prior to initial core load.

Test Method

The containment enclosure area will be leak tested by demonstrating equipment ability to provide negative pressure.

Both containment enclosure exhaust filter subsystems will be tested to verify that independently they can establish and maintain the containment enclosure area at, or greater than, 0.25 inches water negative pressure within the required time following a containment isolation signal.

Acceptance Criteria

Containment enclosure area leakage meets design and safety analysis requirements as set forth in Updated FSAR Subsection 6.5.1.

Preoperational Test Abstracts

25. CONTAINMENT COMBUSTIBLE GAS CONTROL SYSTEM

Objective

To demonstrate the proper operation of the Containment Combustible Gas Control System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Containment combustible gas control system operability checks, flow verification tests, and control system functional tests will be performed to demonstrate proper system performance.

Acceptance Criteria

The Containment Combustible Gas Control System operates in accordance with the requirements of Updated FSAR Subsection 6.2.5.

Preoperational Test Abstracts

26. CONTAINMENT AIR RECIRCULATION SYSTEM

Objective

To demonstrate proper operation of the Primary Containment Air Recirculation System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Primary containment air recirculation system equipment operability checks and control system functional checks will be performed to verify:

a. Air flow for required containment air mixing.

b. Recirculation fans auto start on containment pressure high-high (P) signal.

c. Redundant systems will function properly in either "recirculation" or "filter" mode.

d. Filters will be installed and in-place filter verification tests will be conducted in accordance with Regulatory Guide 1.140.

Acceptance Criteria

Containment air recirculation systems demonstrated to operate satisfactorily in accordance with design requirements set forth in Updated FSAR Subsection 9.4.5.

Preoperational Test Abstracts

27. FUEL STORAGE BUILDING VENTILATION SYSTEM

Objective

To demonstrate proper operation of the Fuel Storage Building ventilation system.

Plant Conditions/Prerequisites

Prior to receipt of new fuel.

Test Method

Fuel storage building ventilation equipment operability check and control system functional test will be performed to verify:

a. Proper air flows in both normal and fuel handling modes.

b. Normal exhaust isolation and Fuel Storage Building established and maintained at 0.25 inches water negative pressure when in fuel handling mode.

c. Filters will be installed, and in-place filter verification testing conducted to satisfy Regulatory Guide 1.52.

Acceptance Criteria

Fuel storage building ventilation system tests satisfactorily demonstrate ability to meet, or exceed, design requirements per Updated FSAR Subsections 9.4.2 and 6.5.1.

Preoperational Test Abstracts

28. CONTROL ROOM HVAC

Objective

To demonstrate proper operation of the control room heating, ventilating, and air conditioning system.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

The control room complex, excluding computer room HVAC equipment, HVAC subsystems will be demonstrated by equipment operability checks and control(s) functional tests.

Air flow verification tests will be performed.

Makeup air filters will be installed, and in-place filter verification testing will be done to satisfy Regulatory Guide 1.140.

"Control room envelope" boundary seals will be verified by demonstrating the ability to maintain the "envelope" at the required positive pressures.

Emergency air cleanup subsystem automatic initiation on "S" safety injection signal, and makeup air isolation on high radiation signal will be verified.

Acceptance Criteria

The control room complex ventilation subsystems will be satisfactorily demonstrated to meet or exceed safety and design requirements, as stated in Updated FSAR Section 6.4 and Subsection 9.4.1.

Preoperational Test Abstracts

29. EMERGENCY SWITCHGEAR VENTILATION

Objective

To demonstrate the proper operation of the emergency switchgear and cable spreading area ventilation systems.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

The emergency switchgear and cable spreading areas ventilation systems shall have equipment operability checks and control system functional tests performed.

Tests will include battery room(s) and electrical tunnel(s) ventilation subsystems.

Air flow verification tests will be performed on all subsystems. In particular, equipment will be demonstrated capable of:

a. Maintaining battery rooms at slightly negative pressure to prevent hydrogen exfiltration.

b. 4-kV switchgear areas at a slightly positive pressure to prevent infiltration of dirt and dust.

Acceptance Criteria

Operation of emergency switchgear and cable spreading area ventilation, including all subsystems, shall be demonstrated satisfactory under normal and emergency conditions per design criteria in Updated FSAR Subsections 9.4.9 and 9.4.10.

Preoperational Test Abstracts

30. AC ELECTRICAL DISTRIBUTION

Objective

To demonstrate the capability of the offsite power system to serve as a source of power to the emergency buses.

Plant Conditions/Prerequisites

During hot functional testing and prior to initial core loading.

Test Method

During hot functional testing the analytical techniques and assumptions used in the voltage analyses will be verified by actual measurement. These tests will meet the requirements of NRC Branch Technical Position, PSB 1, Adequacy of Station Electrical Distribution System Voltage.

Subsequent to hot functional testing, tests will be performed to demonstrate the transfer capabilities between the UATs and the RATS. Undervoltage protection will also be demonstrated at this time.

Acceptance Criteria

The AC electrical distribution system operates in accordance with the requirements of Updated FSAR Section 8.3.

Preoperational Test Abstracts

31. 125V DC DISTRIBUTION SYSTEM

Objective

To demonstrate the proper operation of the 125V DC Distribution System.

Plant Conditions/Prerequisites

Prior to loss of offsite power tests.

Test Methods

Tests will be performed to demonstrate operation of instrumentation and alarms, and that actual total system amperage loads are in agreement with design loads. A discharge test of each battery bank will be conducted. System interlocks will be verified to demonstrate proper operation under accident conditions. The independence of redundant power supplies and load groups will be verified.

Tests will be performed on selected circuits to ensure proper operation of the safety related DC loads at the minimum battery terminal voltage.

Acceptance Criteria

The DC power system operates in accordance with the requirements of Updated FSAR Subsection 8.3.2.

Preoperational Test Abstracts

32. 120V AC VITAL INSTRUMENT POWER SUPPLY

Objective

To demonstrate the proper operation of the 120V AC vital instrumentation power supply.

Plant Conditions/Prerequisites

Prior to loss of offsite power tests.

Test Methods

Full-load tests for the uninterruptible power supplies to the vital buses will be conducted using normal and emergency sources of power supplies to the bus. System interlocks will be verified to demonstrate proper operation. The independence of the redundant power supplies and load groups will be verified.

Acceptance Criteria

The 120V AC Vital Instrument Power Supply System operates in accordance with Updated FSAR Subsection 8.3.1.1d.

Preoperational Test Abstracts

33. DIESEL GENERATORS

Objective

To demonstrate reliability and extended full-load carrying capability of the emergency diesel generator units.

Plant Conditions/Prerequisites

Prior to core loading. Where possible, diesel generator reliability testing will be completed prior to loss of offsite power test.

Test Method

System and component operability checks will be performed on the diesel engine support and ventilation systems.

Protective features and interlocks will be demonstrated operable.

Full load-carrying capability for an interval of not less than 24 hours will be demonstrated operable in accordance with Regulatory Guide 1.108 position 2.a(3).

Diesel generator load shedding will be demonstrated operable in accordance with Regulatory Guide 1.108 position 2.a(4).

Diesel generator functional capability at full-load temperature will be demonstrated operable in accordance with Regulatory Guide 1.108 position 2.a(5) with exception as described in Updated FSAR Section 1.8.

Diesel generator reliability will be demonstrated by performing 35 consecutive valid starts per diesel generator in accordance with Regulatory Guide 1.108 position 2.a(9).

Acceptance Criteria

The diesel generators operate in accordance with the requirements of Updated FSAR Subsection 8.3.1.1e and complete the testing specified above.

Preoperational Test Abstracts

34. FUEL HANDLING AND TRANSFER EQUIPMENT

Objective

To demonstrate the proper operation of fuel handling equipment.

Plant Conditions/Prerequisites

Prior to storage of new fuel and initial core loading, as applicable. Dynamic and static load testing of cranes, hoists, and associated lifting and rigging equipment, including the fuel cask handling has been completed. Static testing has been performed at 125% of rated load and full operational testing has been performed at 100% of rated load.

Test Method

Tests will be performed prior to core loading to demonstrate the functional operability, controls and protective interlocks of the fuel handling and transfer equipment used for handling spent fuel. Components required for new fuel storage will be checked prior to the receipt of new fuel.

Acceptance Criteria

The fuel handling and transfer equipment operate in accordance with the requirements of Updated FSAR Subsections 9.1.1 and 9.1.2.

Preoperational Test Abstracts

35. REACTOR COOLANT SYSTEM HYDROSTATIC TEST

Objective

To perform a cold hydrostatic test of the Reactor Coolant System.

Plant Conditions/Prerequisites

Prior to hot functional testing.

Test Method

Prior to pressurization, the Reactor Coolant System will be heated above the minimum temperature for pressurization. A hydrostatic test of the Reactor Coolant System and adjoining unisolable piping will be conducted to the requirements of ASME B&PV Code, Section III. The pressure will be increased in increments and at each increment inspections will be made for leakage. Leaky valve seats or mechanical joints will not be a basis for rejecting the test.

Acceptance Criteria

The hydrostatic test meets the requirements of ASME B&PV Section III.

Preoperational Test Abstracts

36. PRIMARY CONTAINMENT STRUCTURAL INTEGRITY TEST

Objective

To perform a structural integrity verification of the containment structure.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

A structural acceptance test will be performed in accordance with Regulatory Guide 1.18.

The Containment will be pressurized to 115% (60 psig) of the design pressure (52 psig), with inside and outside temperatures monitored and controlled.

Structural responses to test conditions will be measured and compared to predicted responses, to verify that structural behavior is as analytically anticipated.

Acceptance Criteria

The reactor containment structure meets structural integrity design requirements, as defined by regulatory guides and codes described in Updated FSAR Sections 3.1, 3.8 and 6.2.

Preoperational Test Abstracts

37. PRIMARY CONTAINMENT LEAK RATE TESTS

Objective

To perform the initial primary containment leak rate tests.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Type A, B and C primary containment leak rate tests will be performed in accordance with the requirements of 10 CFR 50, Appendix J.

Prior to the Type A test, Type C (containment isolation valve leakage rate test) tests will be performed at a pressure not less than Pa (46.1 psig). Valve leakage rates will be recorded and verified within allowable design limits.

Prior to the Type A test and concurrent with Type C tests, Type B (containment penetration leakage rate test) tests will be performed on containment airlocks, hatches, electrical penetration and fuel transfer tube, at a pressure not less than Pa.

Type C and B leakage rate results will be totaled and verified within allowable design limits.

On completion of all prerequisite testing, the Containment will be pressurized to Pa; while pressure, temperature and dew point will be controlled, recorded and allowed to stabilize. Test conditions will be maintained for a minimum 24 hour period and, utilizing the perfect gas law, leakage rate in percent per day will be computed from the changes in containment air mass.

At the end of the prescribed test period, an instrument accuracy verification test will be performed on the Containment to verify test instrumentation and test results accuracy.

Acceptance Criteria

Type A, B and C leak rates and instrumentation accuracy is verified to be within allowable design limits as set forth in the Updated FSAR Section 6.2.

Preoperational Test Abstracts

38. ESF INTEGRATED ACTUATION TEST

Objective

To demonstrate proper plant system response to ESF actuation signals.

Plant Conditions/Prerequisites

Prior to initial core loading and subsequent to hot functional testing.

Test Method

Simulated ESF signals will be introduced and the integrated plant response will be monitored to verify proper pump, valve, and diesel generator actuation.

Acceptance Criteria

The ESF actuation signals operate in accordance with safety analysis requirements of the Updated FSAR Subsections 6.2.2 and 6.3.2.

Preoperational Test Abstracts

39. LOSS OF OFFSITE POWER TESTS

Objective

To demonstrate the proper response of plant systems to a loss of offsite power.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Startup operation of the diesel generator units will be demonstrated by simulating loss of all AC voltage in accordance with Regulatory Guide 1.108 position 2.a(l).

Proper operation for design-accident-loading-sequence to design-load requirements will be demonstrated in accordance with Regulatory Guide 1.108 position 2.a(2). This testing will be conducted with one diesel generator unit at a time. The bus not being tested will be monitored to verify absence of voltage. Load testing of the batteries will also be demonstrated.

The ability to (a) synchronize with offsite power, (b) transfer load to offsite power, (c) isolate the diesel generator unit, and (d) restore it to standby status will be demonstrated in accordance with Regulatory Guide 1.108 position 2.a(6).

The capability of the diesel generator unit to supply emergency power within the required time is not impaired during periodic testing and will be demonstrated in accordance with Regulatory Guide 1.108 position 2.a(8).

Testing will be conducted in which both diesel generator units will be started simultaneously to help identify certain common failure modes undetected in single diesel generator unit tests in accordance with Regulatory Guide 1.108 position 2.b.

Acceptance Criteria

Diesel generator operation and circuit breaker sequencing are in accordance with the Updated FSAR design requirements of Section 8.3.

Preoperational Test Abstracts

40. INTEGRATED HOT FUNCTIONAL TESTS

Objective

To verify the proper operation of various primary and secondary instrumentation, controls and components at normal operating temperatures and pressures and to provide general guidance for the conduct of hot functional testing.

Plant Conditions/Prerequisites

Prior to initial criticality.

Test Method

General guidelines to conduct the hot functional test program will be provided. Following plant heatup, the reactor coolant temperature and pressure will be maintained at normal operating values. A series of tests, which are listed below, will be performed to verify system operation.

a. Demonstration of the Pressurizer Pressure Control System ability to maintain RCS pressure.

b. Demonstration of the Pressurizer Level Control System ability to maintain pressurizer level.

c. Demonstration of the RCS leak detection capability.

d. Verification of steam generator level instrumentation operability.

e. Verification of selected primary and secondary plant instrumentation operability.

f. Demonstration of the remote shutdown panel to maintain the plant in a hot shutdown condition.

g. Initial roll of the turbine generator with main steam, including verification of turbine stop, reheat and intercept valve operation.

h. Verification of pressurizer and main steam safety valve setpoints.

i. Demonstration of condenser steam dump valve operation.

j. Demonstration of containment penetration cooling capacity.

Preoperational Test Abstracts

40. INTEGRATED HOT FUNCTIONAL TESTS (Continued)

In addition to the above, other tests specified in Tables 14.2-3 and 14.2-4 as being performed during hot functional testing will be performed at this time. After the completion of at temperature testing, the plant will be cooled down.

Acceptance Criteria

The plant has been operated at hot condition in accordance with normal plant operating procedures and the following systems operate in accordance with the requirements of the Updated FSAR or Technical Specifications listed below:

System	
Pressurizer pressure control	Updated FSAR Subsection 7.7.1
Pressurizer level control	Updated FSAR Subsection 7.7.1
RCS leak detection capability	Updated FSAR Subsection 5.2.5
Remote shutdown panel	Updated FSAR Subsection 7.4.1.3
Turbine generator	Updated FSAR Section 10.2
Pressurizer safety valve lift setting	TS 3.4.2.1
Steam line safety valve lift setting	TS Table 3.7-2

Preoperational Test Abstracts

41. INTEGRATED PLANT HEATUP FOR HOT FUNCTIONAL TESTS

Objective

To demonstrate the ability to bring the plant to normal operating temperature and pressure from a cold shutdown condition.

Plant Conditions/Prerequisites

The plant is at cold shutdown conditions following the performance of the primary hydrostatic test.

Test Method

The plant will be brought to normal operating pressure and temperature using reactor coolant pump heat. The test instructions will be based upon normal plant operating procedures to verify their methods. At specific points, the heatup will be terminated to allow the performance of specified hot functional tests.

Demonstration of the steam line atmospheric dump valves will be conducted during plant heat up.

Acceptance Criteria

The plant has been brought to normal operating temperature and pressure in accordance with normal plant operating procedures.

Preoperational Test Abstracts

42. INTEGRATED PLANT COOLDOWN FROM HOT FUNCTIONAL TESTS

Objective

To demonstrate the ability to bring the plant from normal operating temperature and pressure to cold shutdown conditions.

Plant Conditions/Prerequisites

The plant is at normal temperature and pressure following the completion of hot functional testing.

Test Method

The plant will be brought to hot shutdown conditions using steam dumps and the Residual Heat Removal System, from outside the control room. After initiation of residual heat removal system cooling, the plant will be further cooled an additional 50°F. After the additional 50°F cooldown, control will be transferred back to the control room. During operation of the Residual Heat Removal System, cooldown rates will be monitored and controlled, and data will be collected to verify its heat removal capability. The cooldown limitations of Technical Specification 3.4.9.1 will not be exceeded. At specific points, the cooldown will be terminated to allow the performance of specified hot functional tests.

Acceptance Criteria

The plant has been brought to cold shutdown conditions in accordance with normal plant operating procedures.

Preoperational Test Abstracts

43. REACTOR POST-HOT FUNCTIONAL INSPECTION

Objective

To provide a sequence of operations to be followed after hot functional tests to disassemble, clean, and inspect the reactor vessel and internals.

Plant Conditions/Prerequisites

After completion of hot functional testing and prior to initial core loading.

Test Method

Instructions will be given describing the required steps to disassemble, inspect, and clean the reactor vessel and its internals.

Acceptance Criteria

The reactor vessel is cleaned to the requirements of plant procedures and the internals are inspected in accordance with Updated FSAR Subsection 3.9(N).2.4.

Preoperational Test Abstracts

44. PLANT VENTILATION SYSTEMS FILTER TESTING

Objective

To demonstrate the proper operation of in-place plant filters.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

In-place HEPA filters will be visually inspected, and airflow capacity measured. A leak test will be conducted and the associated fan vibration measured.

Acceptance Criteria

In-place filters have been installed properly and have not been damaged. No circuitous flow paths which would compromise the filters/absorbers exist.

Airflow capacity meets applicable fan design requirements and airflow distribution meets ANSI N510-1980.

Duct heaters perform as required by ANSI N510-1980.

Fan vibration meets the criteria of ANSI N509-1980.

Preoperational Test Abstracts

45. PRIMARY AUXILIARY BUILDING VENTILATION SYSTEM

Objective

To demonstrate proper operation of the Primary Auxiliary Building Ventilation System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Primary auxiliary building ventilation equipment and controls will be tested to demonstrate required functional operability.

Air flows will be verified on all subsystems (normal and filtered clean-up systems).

Filters will be installed and in-place filter verification tests conducted to satisfy Regulatory Guide 1.140. This testing will be performed in the Updated FSAR , Item 44.

Acceptance Criteria

Primary auxiliary building ventilation subsystems have been demonstrated to function per design for normal and emergency operational modes as described in Updated FSAR Section 6.5 and Subsection 9.4.3.

TABLE 14.2-4 ACCEPTANCE TEST ABSTRACTS

Acceptance Test Abstracts

1. FEEDWATER SYSTEM

Objective

To demonstrate the proper operation of the Feedwater System.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Prior to hot functional testing, the operability of the startup feedwater pump will be demonstrated. The control and performance characteristics of the turbine-driven feedwater pumps will be operationally checked to the extent practical using the auxiliary boiler as a source of steam. During hot functional tests, the operation of the turbine-driven feedwater pumps will be demonstrated using main steam.

Acceptance Criteria

The Feedwater System operates in accordance with the requirements of Updated FSAR Subsections 10.4.7 and 10.4.12 for the conditions prevalent during hot functional testing.

Acceptance Test Abstracts

2. EXTRACTION STEAM AND HEATER DRAIN SYSTEMS

Objective

To demonstrate the proper operation of the extraction steam and heater drain system equipment.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Functional tests will be performed to verify, to the extent practical, the proper operation of equipment associated with the extraction steam and heater drain systems.

Acceptance Criteria

The extraction steam and heater drain systems performance, to the extent practical, is in accordance with Updated FSAR Subsections 10.2.2.3 and 10.4.7 in response to simulated input signals.

Acceptance Test Abstracts

3. CONDENSATE SYSTEM

Objective

To demonstrate the proper operation of the condensate system.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Tests will be performed to demonstrate the operational performance characteristics of the condensate pumps, the hotwell level control system, and the condensate makeup water system.

Acceptance Criteria

The condensate system operates in accordance with the requirements of Updated FSAR Subsection 10.4.7 at conditions prevalent up to and including hot functional testing.

Acceptance Test Abstracts

4. CONDENSER AIR REMOVAL SYSTEMS

Objective

To demonstrate the proper operation of the condenser air removal equipment.

Plant Conditions/Prerequisites

Prior to hot functional testing.

Test Method

Tests will be performed to verify the operation and operational characteristics of the condenser vacuum pumps and the water box priming pumps.

Acceptance Criteria

The Condenser Air Removal System operates in accordance with the requirements of the Updated FSAR Subsection 10.4.2.

Acceptance Test Abstracts

5. CHEMICAL ADDITION SYSTEM

Objective

To demonstrate the proper operation of the Secondary Plant Chemical Addition System.

Plant Conditions/Prerequisites

Prior to hot functional testing.

Test Method

Functional tests will be performed on the chemical addition pumps and associated instrumentation and controls to demonstrate proper operation.

Acceptance Criteria

The chemical addition system operates in accordance with the requirements of Updated FSAR Subsection 10.3.5.

Acceptance Test Abstracts

6. CIRCULATING WATER SYSTEM

Objective

To demonstrate the proper operation of the Circulating Water System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Functional testing of system components, instrumentation and controls will be performed to demonstrate operability. An overall system dynamic performance test will be run to determine specific system operating parameters and response during steady-state, transient, and backflush operational modes. Proper operation of the pumphouse ventilation system will be verified.

Acceptance Criteria

The Circulating Water System operates in accordance with the requirements of Updated FSAR Subsection 10.4.5.

Acceptance Test Abstracts

7. SECONDARY COMPONENT COOLING WATER SYSTEM

Objective

To demonstrate the proper operation of the Secondary Component Cooling Water (SCCW) System.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Prior to hot functional testing, system component operability checks and control system functional tests will be performed. During hot functional testing, data will be taken to the extent practical to verify that adequate cooling is being provided to SCCW components.

Acceptance Criteria

Secondary Component Cooling Water System operates in accordance with Updated FSAR Subsection 10.4.10.

Acceptance Test Abstracts

8. CVCS - LETDOWN DEGASIFIER

Objective

To demonstrate the proper operation of the letdown degasifier portion of the CVCS.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Functional tests will be performed to demonstrate the operational characteristics and performance of the CVCS letdown degasifier.

Acceptance Criteria

The letdown degasifier operates in accordance with Updated FSAR Subsection 9.3.4.2e.11.

Acceptance Test Abstracts

9. REACTOR MAKEUP WATER SYSTEM

Objective

To demonstrate the proper operation of the Reactor Makeup Water System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Functional testing of system components, instrumentation, and controls will be performed to demonstrate the ability of this system to transfer water to other plant systems.

Acceptance Criteria

The Reactor Makeup Water System operates in accordance with Updated FSAR Subsection 9.2.7.

Acceptance Test Abstracts

10. SAMPLING SYSTEM

Objective

To verify the proper operation of the plant sampling systems and installed analysis equipment.

Plant Conditions/Prerequisites

This test will be performed during operation of the systems which are served by the sample system. The major portion of this test will be performed during hot functional testing.

Test Method

Samples will be drawn from each of the primary and secondary sample points to verify proper piping arrangement and function. Holdup times for the sample lines from reactor coolant loops 1 and 3 will also be verified. The installed chemical analysis equipment will be operationally checked to the extent practical.

Acceptance Criteria

Sample point identification and piping arrangement has been verified.

The sampling system operates in accordance with the design requirements of Updated FSAR Subsection 9.3.2.1.

Acceptance Test Abstracts

11. REACTOR COOLANT DRAIN SYSTEM

Objective

To demonstrate the proper operation of the Reactor Coolant Drain System.

Plant Conditions/Prerequisites

Prior to hot functional testing.

Test Method

The reactor coolant drain tank, pumps and associated components will be functionally tested to verify proper performance in the various system operating modes.

Acceptance Criteria

The Reactor Coolant Drain System operates in accordance with the design requirements of Updated FSAR Subsection 9.3.5.2.

Acceptance Test Abstracts

12. INSTRUMENT AND SERVICE AIR SYSTEMS

Objective

To demonstrate the proper operation of the Instrument and Service Air Systems.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Methods

Functional testing of system components, instruments, and controls for the plant and containment building air system will be performed to demonstrate operability. Testing of components which perform a safety-related function will be performed during the respective system preoperational test.

Acceptance Criteria

Instrumentation, controls, alarms and interlocks operate as required in accordance with Updated FSAR Subsection 9.3.1 in response to normal or simulated input signals.

Acceptance Test Abstracts

13. FIRE PROTECTION SYSTEM

Objective

To demonstrate the proper operation of the fire protection system.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Methods

Tests will be performed to demonstrate proper operation of fire protection subsystem equipment and controls as follows:

a. Capacity tests of the fire pumps

b. Actuation tests of the water and halon systems

c. Proper operation of the smoke and fire detection systems

d. Fire pumphouse heating and ventilation

e. Fire protection interlocks with other (i.e., HVAC) plant systems

Acceptance Criteria

Demonstration of fire protection system performance satisfies codes and regulations per design, as stated in Updated FSAR Subsection 9.5.1.

Acceptance Test Abstracts

14. RADIOACTIVE GASEOUS WASTE SYSTEM

Objective

To demonstrate the proper operation of radioactive gaseous waste system components.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Operability tests will be performed on system components, instrumentation and controls to the extent practical to verify proper operation.

Acceptance Criteria

The radioactive gaseous waste system operates in accordance with Updated FSAR Section 11.3.

Flow paths to all system components have been demonstrated.

Acceptance Test Abstracts

15. LIQUID WASTE SYSTEM

Objective

To demonstrate the proper operation of liquid waste system components.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Tests will be performed to the extent practical to verify the proper operation of the liquid waste system components, instrumentation, and controls. Isolation of liquid waste will be demonstrated.

Tests will be performed to verify the proper operation of the equipment and floor drainage system sump/tank high level alarms.

Acceptance Criteria

Flow paths to the liquid waste system components have been demonstrated.

The liquid waste system operates in accordance with Updated FSAR Section 11.2. The equipment and floor drainage system operates in accordance with the Updated FSAR Subsection 9.3.3.

Acceptance Test Abstracts

16. SPENT RESIN SLUICE SYSTEM

Objective

To demonstrate the proper operation of the resin sluice system equipment.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Functional tests of system components, instrumentation, and controls will be performed to verify, to the extent practical, the proper operation of resin sluice system equipment.

Acceptance Criteria

The Spent Resin Sluice System operates in accordance with Updated FSAR Subsection 11.4.2.3a.

Flow paths to system components have been demonstrated.

Acceptance Test Abstracts

17. WASTE SOLIDIFICATION SYSTEM

Objective

To demonstrate the proper operation of waste solidification system equipment.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Tests will be performed to the extent practical to verify proper operation of system components, instrumentation and controls. Solidification of test samples, representative of the expected wastes, will be performed to verify proper operation of the Waste Solidification System.

Acceptance Criteria

The Waste Solidification System operates in accordance with Updated FSAR Subsection 11.4.2.4.

Acceptance Test Abstracts

18. BORON RECOVERY SYSTEM

Objective

To demonstrate the proper operation of boron recovery system equipment.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Tests will be performed to the extent practical to verify proper operation of system components, instrumentation, and controls for the Boron Recovery System.

Acceptance Criteria

Instrumentation, controls, alarms and interlocks operate as required in accordance with Updated FSAR Subsection 9.3.5 in response to normal or simulated input signals.

Flow paths to system components have been demonstrated.

Acceptance Test Abstracts

19. STEAM GENERATOR BLOWDOWN SYSTEM

Objective

To demonstrate proper operation of the Steam Generator Blowdown System.

Plant Conditions/Prerequisites

Prior to hot functional testing, and prior to initial core loading.

Test Method

Prior to hot functional tests, testing will be performed on system components, instrumentation and controls to the extent practical.

Prior to initial core loading, the overall system operation will be demonstrated.

Acceptance Criteria

Instrumentation, controls, alarms and interlocks operate as required in accordance with Updated FSAR Subsection 10.4.8 in response to normal or simulated input signals.

Flow paths to system components are demonstrated.

Acceptance Test Abstracts

20. WASTE PROCESSING BUILDING HVAC SYSTEM

Objective

To demonstrate the proper operation of the Waste Processing Building HVAC system.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Tests will be performed to verify proper operation of system components, instrumentation and controls and to verify air flows. Filters will be installed and in-place filter testing conducted in accordance with Regulatory Guide 1.140.

Acceptance Criteria

Demonstration that Waste Processing Building HVAC performs in accordance with design, as stated in Updated FSAR Section 6.5 and Subsection 9.4.4.

Acceptance Test Abstracts

21. CONTAINMENT COOLING SYSTEMS

Objective

To demonstrate proper operation of the containment cooling systems.

Plant Conditions/Prerequisites

Prior to and during hot functional tests.

Test Method

Containment cooling and control rod drive mechanism cooling subsystems will be tested to demonstrate equipment and controls functional operability.

Individual and integrated air flow verification will be performed.

During hot functional tests, subsystems will be operated and sufficient data recorded and evaluated to ascertain ability to satisfy containment temperature requirements.

Acceptance Criteria

Containment structure cooling subsystems have been demonstrated capable of establishing and maintaining containment temperature(s) as required in Updated FSAR Subsection 9.4.5.

Acceptance Test Abstracts

22. CONTAINMENT PURGE SYSTEM

Objective

To demonstrate proper operation of the Primary Containment Purge System.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Containment purge subsystems equipment and controls operability will be verified.

Containment "online" and "pre-entry/refueling" purge will be operated with heating equipment (as necessary) and in conjunction with containment recirculation filter system to demonstrate ability to control temperature levels as required by design.

Filters will be installed and in-place verification tests will be conducted to satisfy Regulatory Guide 1.140.

Acceptance Criteria

Containment purge systems have been demonstrated capable of required heating and atmosphere cleanup as required in Updated FSAR Subsection 9.4.5.

Acceptance Test Abstracts

24. ELECTRICAL PENETRATION AREA AIR CONDITIONING SYSTEM

Objective

To demonstrate proper operation of the electrical penetration area air conditioning system.

Plant Conditions/Prerequisites

Prior to and during hot functional testing.

Test Method

Tests will be performed to verify the proper operation of system components and controls for the electrical penetration area air conditioning system. During hot functional testing, data will be recorded to verify satisfactory area temperatures.

Acceptance Criteria

The electrical penetration area air conditioning system operates in accordance with Updated FSAR Subsection 9.4.7.

Acceptance Test Abstracts

25. TURBINE BUILDING VENTILATION

Objective

To demonstrate proper operation of the Turbine Building ventilation system.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Turbine building ventilation system functional tests will be performed to verify equipment operation and air flows.

Acceptance Criteria

The Turbine Building ventilation system operates in accordance with United Engineers & Constructors Inc., System Design Description for Turbine Building Heating and Ventilating System (SD-45).

Acceptance Test Abstracts

26. ROD CONTROL SYSTEM

Objective

To verify the proper operation of the rod control system logic and power supplies.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

To the extent practical, rod control system tests will be performed to verify proper operation of system logic and associated alarm and interlock functions. The operation of the rod control motor-generator sets will be demonstrated.

Acceptance Criteria

The rod control system logic, interlocks indication and power supplies have demonstrated the design requirements specified in Updated FSAR Section 7.7.

Acceptance Test Abstracts

27. INDIVIDUAL ROD POSITION INDICATION SYSTEM

Objective

To verify proper operation of the digital rod position indication (DRPI) system logic.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

To the extent practical, tests will be performed to verify proper operation of the DRPI logic.

Acceptance Criteria

The digital rod position indication system logic and indication has been demonstrated to perform the design function required by Updated FSAR Section 7.7.

Acceptance Test Abstracts

28. COMPUTER

Objective

To demonstrate the operation of the plant computer and the associated software.

Plant Conditions/Prerequisites

Prior to initial criticality.

Test Method

Tests will be performed to demonstrate computer interface with plant parameters and computer response to changing variables.

Annunciators for reactor control and engineered safety features will be demonstrated operable.

Acceptance Criteria

Computer interface with plant parameters and the computer response to changing parameters are in accordance with computer Input/Output List, DWG-M-510004.

Acceptance Test Abstracts

29. PRIMARY PLANT INSTRUMENTATION

Objective

To verify the initial calibration of the primary plant instrumentation.

Plant Conditions/Prerequisites

Prior to hot functional testing for specified instruments, otherwise prior to initial core loading.

Test Method

The calibration and alignment of various primary plant instrumentation (temperature, pressure, level, flow) will be performed to verify the operation of each instrument and associated setpoints. Plant calibration procedures will be used to the maximum extent practical.

Acceptance Criteria

The primary plant instrumentation has been calibrated to within the setpoint accuracies required by Technical Specifications Tables 2.2-1 and 3.3-4.

Acceptance Test Abstracts

30. RADIATION MONITORING SYSTEM

Objective

To verify proper operation of the process, area, and airborne radiation monitors.

Plant Conditions/Prerequisites

Prior to initial core loading. Fuel storage building monitors will be tested prior to new fuel storage.

Test Method

The radiation monitors will be calibrated and functionally tested to demonstrate proper operation of the channels and any associated interlock and alarm functions.

Acceptance Criteria

The Radiation Monitoring System and associated indicator and interlocks have been demonstrated to perform the design requirements specified in Updated FSAR Section 11.5.

Acceptance Test Abstracts

31. SEISMIC MONITORING SYSTEM

Objective

To verify the proper operation of the seismic monitoring instrumentation.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

The seismic monitoring instrumentation will be calibrated and functionally tested.

Acceptance Criteria

The operability of the Seismic Monitoring System and its associated indication will be demonstrated as meeting the requirements of Technical Specification Table 3.3-7.

Acceptance Test Abstracts

33. COMMUNICATIONS SYSTEM

Objective

To verify proper operation of the plant page and sound powered phone systems. To verify operability of other plant communications that are utilized in the facility emergency plan.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Communications will be verified between stations, and the outputs of speakers and amplifiers will be adjusted as required.

Acceptance Criteria

The communications system operates in accordance with Updated FSAR Subsections 9.5.2.2a.2 and 9.5.2.2a.3.

Acceptance Test Abstracts

34. EMERGENCY LIGHTING

Objective

To demonstrate the operation of the emergency lighting system.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Tests will be performed to demonstrate the operation of the emergency lighting systems during partial and total loss of AC power.

Acceptance Criteria

The emergency lighting system operates in accordance with Updated FSAR Subsection 9.5.3.2c.

Acceptance Test Abstracts

35. POLAR CRANE

Objective

To demonstrate the proper operation of the containment polar crane.

Plant Conditions/Prerequisites

Prior to initial core loading. Dynamic and static load tests of the polar crane and associated lifting and rigging equipment has been performed. Static testing at 125 percent of rated load and full operational testing at 100 percent of rated load has been performed.

Test Method

Functional tests will be performed to demonstrate proper operation of the crane and its controls. The operation of interlocks and safety devices will be verified.

Acceptance Criteria

The polar crane operates in accordance with Updated FSAR Subsection 9.1.4.3a.6.

TABLE 14.2-5 Startup Test Abstracts

Index

Index

1. STARTUP PROGRAM ADMINISTRATION

Objective

To provide general guidance for the administration of the initial startup test program and a recommended sequence for the conduct of startup testing.

Plant Conditions/Prerequisites

A list of general precautions for the overall test program are presented. General plant conditions are specified in the test sequence with specific requirements delineated in individual tests.

Test Method

General program information and guidelines, including personnel duties and responsibilities are outlined in the Startup Test Program Description. ST-1 presents precautions and guidelines for actual test performance, test sequencing, and power escalations. Specific instructions are given in individual tests. A recommended sequence of testing is included, along with test program holdpoints.

Acceptance Criteria

A recommended sequence of startup testing has been developed. Administrative guidelines for startup testing have been provided.

2. PRIMARY SOURCE INSTALLATION

Objective

To provide detailed instructions for the handling and installation of the primary sources into the required fuel assemblies.

Plant Conditions/Prerequisites

Prior to initial core loading.

Test Method

Instructions include a sequence of steps for unloading the shipping cask and installation of the sources into the respective fuel assemblies.

Acceptance Criteria

The primary sources are loaded in the required fuel assemblies.

3. CORE LOADING PREREQUISITES

Objective

To provide a detailed list of plant conditions, systems, and equipment necessary for a safe and controlled core loading.

Plant Conditions/Prerequisites

Plant conditions are established as required by test instructions.

Test Method

A detailed list will summarize plant system and equipment status required prior to the start of core loading. In addition, sampling of reactor coolant and associated auxiliary systems will be performed to verify uniform boron concentration and the alignment, calibration, and response of the temporary core loading instrumentation will be verified. Final functional testing of the Reactor Protection System will be verified.

Acceptance Criteria

All requirements specified in the procedure have been completed.

4. INITIAL CORE LOADING

Objective

To provide detailed instructions for the conduct of initial core loading in a safe, controlled manner.

Plant Conditions/Prerequisites

Required preoperational testing is complete and plant systems are operational as required by the core loading prerequisites.

Test Method

A detailed loading sequence giving specific fuel assembly identification numbers and core locations will be provided with appropriate data taking requirements. Specific administrative control and core monitoring, procedures to be applied during initial fuel loading will be provided.

Acceptance Criteria

Detailed core loading instructions, including a sequence, have been developed and executed.

5. CONTROL ROD DRIVE MECHANISM OPERATIONAL TEST

Objective

To demonstrate the proper operation of the full-length control rod drive mechanisms (CRDM) and provide verification of proper slave cycler timing.

Plant Conditions/Prerequisites

Prior to initial criticality, during cold shutdown or hot standby conditions as required by the test instructions.

Test Method

During cold shutdown, the ability of the slave cycler devices to supply the proper operating signals to the CRDM stepping magnet coils will be confirmed. The proper operation of each CRDM during both cold and hot plant conditions will be verified by recording CRDM magnet coil currents and audio signals.

Acceptance Criteria

CRDM operation conforms to the requirements of proper mechanism operation as described in Chapter 4 of the Westinghouse Magnetic Control Rod Drive Mechanism Technical Manual.

6. ROD CONTROL SYSTEM

Objective

To demonstrate that the full-length Rod Control System performs the required control and indication functions just prior to initial criticality.

Plant Conditions/Prerequisites

Prior to initial criticality at no load operating temperature and pressure.

Test Method

Testing of control rod withdrawal and insertion speeds and sequences, control functions, status lights, and indication will be performed to verify proper operation.

Acceptance Criteria

The Rod Control System performs the required control and indication functions in accordance with Chapter 3 of the Westinghouse Rod Control System Technical Manual.

7. ROD DROP TIME MEASUREMENT

Objective

To determine the drop time of each full length control rod under various plant conditions.

Plant Conditions/Prerequisites

Prior to initial criticality, during hot standby conditions with full flow in the Reactor Coolant System.

Test Method

During each of the applicable plant conditions, the drop time for each rod control cluster assembly will be determined. Those control rods whose drop times fall outside the two-sigma limit determined from the data for all control rods will be retested at least three times to ensure proper performance.

Acceptance Criteria

The rod drop times meet the requirements given in Technical Specifications, Section 3.1.3.4.

8. ROD POSITION INDICATION

Objective

To verify that the Rod Position Indication System performs the required indication functions for each individual rod and to demonstrate that each control rod operates satisfactorily over its entire range of travel.

Plant Condition/Prerequisites

Prior to initial criticality during hot standby conditions.

Test Method

Each control bank will be fully withdrawn in 24 step increments. Each shutdown bank will be fully withdrawn, stopping at 18, 210, and 228 steps. Individual rod position indication and group step indication data is recorded 43 at each bank holdpoint.

Acceptance Criteria

The Rod Position System meets the requirements of Technical Specifications 3.1.3.2 and functions as described in the Westinghouse Digital Rod Position Indication Technical Manual.

9. PRESSURIZER SPRAY AND HEATER CAPABILITY TEST

Objective

To establish the continuous spray flow rate and to verify pressurizer spray and heater effectiveness.

Plant Conditions/Prerequisites

Prior to initial criticality during hot standby conditions.

Test Method

The spray bypass valves are adjusted for the minimum continuous spray flow. Both spray valves are opened to initiate a pressure transient which is recorded and compared to the expected pressure response. All heaters are energized to initiate a pressure transient which is recorded and compared to expected pressure response.

Acceptance Criteria

The continuous spray flow has been set, and the spray and heater effectiveness is in accordance with the Westinghouse performance curves as attached to ST-9.

10. RESISTANCE TEMPERATURE DETECTOR BYPASS LOOP FLOW VERIFICATION

Objective

To calculate the hot and cold leg bypass line flow rates necessary to provide adequate transport times, to determine the actual flow rates, and to verify the low flow alarm setpoints.

Plant Conditions/Prerequisites

Prior to initial criticality during hot standby conditions.

Test Method

The required bypass loop flows will be calculated from measurements taken on the installed RTD piping and compared to the measured bypass loop flow rates. The hot leg bypass loop isolation valves will be throttled to verify the low flow alarm setpoints.

Acceptance Criteria

The measured flow rates meet the calculated values, with regard to transport times, as defined by the test procedure. The low flow alarms actuate at the setpoint shown in the Westinghouse Precautions, Limitations, and Setpoints Manual.

11. REACTOR COOLANT SYSTEM FLOW MEASUREMENT

Objective

To measure actual reactor coolant system flow.

Plant Conditions/Prerequisites

Prior to initial criticality during hot standby conditions.

Test Method

Measurements will be made of elbow tap differential pressure for each loop. This data will be used to obtain a measurement of actual reactor coolant system flow.

Acceptance Criteria

The calculated reactor coolant system flow rate is greater than the thermal design flow shown in Table 5.1-1 of the UFSAR.

12. REACTOR COOLANT SYSTEM FLOW COASTDOWN

<u>Objective</u>

To measure the rate at which reactor coolant flow changes following various reactor coolant pump trips and to determine delay times associated with the loss of flow accident.

<u>Plant Conditions/Prerequisites</u>

Prior to initial criticality during hot standby conditions.

<u>Test Method</u>

The reactor coolant pumps will be simultaneously tripped from various operating configurations. Data will be recorded for coolant loop differential pressure, coolant pump breaker position, low flow trip relay output, reactor trip breaker position, as required by the test procedure.

<u>Acceptance Criteria</u>

The reactor coolant system flow coastdown rate and measured time delays are conservative with respect to those used in Section 15.3 of the UFSAR.

13. OPERATIONAL ALIGNMENT OF NUCLEAR INSTRUMENTATION

Objective

To determine voltage settings, trip settings, operational settings, alarm settings, and overlap for the source, intermediate, and power range instrumentation.

Plant Conditions/Prerequisites

Portions of this test will be performed prior to core loading, prior to initial criticality, at hot zero power conditions, and during each of the major power plateaus (30%, 50%, 75%, 100%) as required by the test instructions.

Test Method

The nuclear instrumentation will be calibrated and functionally tested using permanently installed control and adjustment mechanisms. The operational settings for the various ranges will be adjusted for their proper function during the applicable portions of the startup program.

Acceptance Criteria

The voltage settings, operational settings, alarm settings, and trip settings have been determined and are within the range shown in Chapter 5 of the Westinghouse Nuclear Instrumentation System Technical Manual and Technical Specification 3.3.1.

14. OPERATIONAL ALIGNMENT OF PROCESS TEMPERATURE INSTRUMENTATION

Objective

To align the ΔT and T_{avg} process instrumentation.

Plant conditions/Prerequisites

As required by the test instructions, portions of this alignment will be performed prior to initial criticality at 30%, 50%, 75% and 100% power plateaus.

Test Method

During plant heatup, installation correction factors will be determined for the RCS RTDS and incore thermocouples.

The ΔT and T_{avg} instrumentation will be aligned at isothermal conditions prior to criticality and at approximately 75% power. An extrapolation of the 75% power data will be made for the 100% power values of ΔT and T_{avg}. At or near full power an alignment check will be performed and any necessary readjustments will be made.

Acceptance Criteria

The ΔT and T_{avg} process instrumentation have been aligned.

15. REACTOR PLANT SYSTEMS SETPOINT VERIFICATION

Objective

To verify that initial setpoint adjustments have been made prior to plant startup and to maintain a record of setpoints which required readjustment during initial startup testing.

Plant Conditions/Prerequisites

Prior to initial criticality and following full power testing.

Test Method

Verify and record initial setpoint values and any changes performed during initial startup testing.

Acceptance Criteria

The initial setpoints are verified to be in agreement with the settings and tolerances specified by the Westinghouse Precautions, Limitations and Setpoints Manuals, and any adjustments made during initial startup testing are recorded.

16. INITIAL CRITICALITY

Objective

To achieve initial criticality in a controlled manner.

Plant Conditions/Prerequisites

The plant is in hot standby conditions and all required portions of the startup testing program have been completed.

Test Method

All control rods will be fully withdrawn except for the controlling bank which will be withdrawn to a preselected position. A controlled dilution will be performed until criticality is achieved. At periodic points during the rod withdrawal and dilution, data will be taken and inverse count rate ratio plots made to enable extrapolation of the expected critical point. Following criticality, the power level for physics testing will be determined and the operation of the reactivity computer will be verified.

Acceptance Criteria

The reactor is critical. The average absolute deviation between indicated reactivity on the reactivity computer and the theoretical values is within the NSSS vendor's guidelines.

17. BORON ENDPOINT MEASUREMENTS

Objective

To determine the critical reactor coolant system boron concentration appropriate for a specific control rod endpoint configuration.

Plant Conditions/Prerequisites

The plant is critical at hot zero power conditions and at the control rod configuration specified by the startup sequence.

Test Method

The boron endpoints will be determined by measuring the boron concentration of the Reactor Coolant System at or near the desired control rod configuration. If required the rods are quickly moved to the desired configuration with no boron adjustment. The change in reactivity is measured and converted to an equivalent amount of boron to yield the endpoint at that rod configuration. The data obtained will be utilized to determine the boron worth.

Acceptance Criteria

The calculated boron worth agrees with the value contained in the Westinghouse Nuclear Design Report for Cycle 1.

18. ISOTHERMAL TEMPERATURE COEFFICIENT MEASUREMENT

Objective

To determine the isothermal temperature coefficient.

Plant Conditions/Prerequisites

The plant is critical at hot zero power conditions and at the control rod configuration specified by the startup sequence.

Test Method

The isothermal temperature coefficient will be determined by alternately heating up and cooling down the Reactor Coolant System at constant rates while data on reactivity and reactor coolant temperatures are obtained.

Acceptance Criteria

The measured values of the isothermal temperature coefficient meet the requirements of the Westinghouse Nuclear Design Report for Cycle 1.

19. FLUX DISTRIBUTION MEASUREMENTS AT LOW POWER

Objective

To measure the reactor core flux distribution at low power.

Plant Conditions/Prerequisites

The plant is at a low power level (less than 5%) at the control rod configuration specified by the startup sequence.

Test Method

The flux distribution will be obtained by analysis of data acquired by means of the Incore Movable Detector System.

Acceptance Criteria

Flux map results are in agreement with the predicted distributions contained in the Westinghouse Nuclear Design Report for Cycle 1.

20. CONTROL ROD WORTH MEASUREMENT

Objective

To determine the differential and integral reactivity worth of an individual control rod bank and to ensure proper shutdown margin.

Plant Conditions/Prerequisites

The plant is critical at zero power at the control rod configuration specified by the startup sequence.

Test Method

Control rod worths will be obtained by maintaining a constant boron addition or dilution and compensating for the reactivity change by rod movement. These changes in reactivity are recorded by a reactivity computer and analyzed to obtain the control rod worths. Analysis of the collected data will be performed to confirm adequate shutdown margin. Additional control rod worth measurements may be conducted using the rod swap technique.

Acceptance Criteria

The measured control rod worths are conservative with respect to the values assumed in Chapter 15 of the UFSAR.

21. PSEUDO ROD EJECTION TEST

Objective

To verify the conservatism of the ejected rod analysis at zero power.

Plant Conditions/Prerequisites

The test will be performed at zero power.

Test Method

The selected RCCA will be fully withdrawn while compensating for the reactivity change by boron additions as necessary. A flux map will be taken to measure the resulting flux distribution.

Acceptance Criteria

Analysis of the data obtained yields rod worths and hot channel factors which are conservative with respect to the values assumed in Subsection 15.4.8 of the UFSAR.

22. NATURAL CIRCULATION TEST

Objective

To verify the ability of the Reactor Coolant System to remove heat by means of natural circulation.

Plant Conditions/Prerequisites

The plant is subcritical with sufficient decay heat to demonstrate natural circulation.

Test Method

With the plant at hot standby conditions, the reactor coolant pumps will be tripped. This test will determine the length of time necessary to stabilize natural circulation and will demonstrate the reactor coolant flow distribution by obtaining incore thermocouple maps. Data will be collected during the test to verify simulator modeling.

Acceptance Criteria

Natural circulation is established and maintained as indicated by stable temperature indication.

23. DYNAMIC AUTOMATIC STEAM DUMP CONTROL

Objective

To verify proper operation of the T_{avg} Steam Dump Control System, to demonstrate the dynamic characteristics of the controller, and to obtain the final settings for steam pressure control of the condenser dump valves.

Plant Conditions/Prerequisites

The plant is critical at no load temperature and pressure.

Test Method

Reactor power will be increased to approximately 5% by rod withdrawal with either a simulated plant trip or load rejection to demonstrate proper operation and setpoint adequacy of the T_{avg} controllers. With the Steam Dump System in the pressure control mode, power will be increased to demonstrate proper operation of the steam header pressure controller. Adjustment of controller gains and/or setpoints will be made as necessary.

Acceptance Criteria

The Steam Dump Control System operates as described in UFSAR Subsection 7.7.1.8, and is capable of maintaining the reactor coolant system temperature at the no load temperature.

24. AUTOMATIC REACTOR CONTROL

Objective

To verify the capability of the Reactor Control System to maintain the reactor coolant average temperature within acceptable limits.

Plant Conditions/Prerequisites

The plant is stable at the 30% power plateau.

Test Method

T_{avg} will be varied from the T_{ref} setpoint and the control system will be placed in automatic to verify its ability to return plant temperature to the reference value.

Acceptance Criteria

The reactor control system functions as described in UFSAR Subsection 7.7.1.1.

25. AUTOMATIC STEAM GENERATOR LEVEL CONTROL

Objective

To verify the stability of the Automatic Steam Generator Level Control System following simulated transients at low power and to verify the operation of the Main Feed Pump Control System.

Plant Conditions/Prerequisites

The plant is stable at the 30% power plateau.

Test Method

Steam generator level transients will be simulated to verify proper level control response. The operability of the Main Feed Pump Control System will be verified by manipulation of the controllers and by simulating selected input signals.

Acceptance Criteria

The Steam Generator Level and Main Feedwater Pump Control Systems function as described in UFSAR Subsection 7.7.1.7.

26. THERMAL POWER MEASUREMENT AND STATEPOINT DATA COLLECTION

Objective

To obtain various primary and secondary plant temperatures, pressures, and flows and to perform a calorimetric determination of reactor power and verify that the Main Steam and Feedwater Systems perform as described in the UFSAR.

Plant Conditions/Prerequisites

This test will be performed at each of the major power plateaus (30%, 50%, 75%, 100%) as required by the startup test sequence.

Test Method

With the plant stable at the required power level, data will be collected to allow calculation of thermal power. Additional statepoint data will be collected to provide baseline plant operating temperatures and pressures. Some of the data collected will be utilized by other tests to align various plant instruments.

Acceptance Criteria

The data specified in the procedure has been collected and calorimetric performed. Main Steam and Feedwater Systems operate as described in UFSAR Subsection 10.4.7.

27. STARTUP ADJUSTMENTS OF REACTOR CONTROL SYSTEM

Objective

To determine the T_{avg} program resulting in the optimum plant efficiency without exceeding plant pressure and temperature limitations.

Plant Conditions/Prerequisites

Portions of this test will be performed at hot zero power and various major power plateaus (50%, 75%, 100%) as required by the startup test sequence.

Test Method

Analysis of system temperature and pressure data obtained by this or other tests at the required plant conditions will be used to provide a basis for the adjustment of the Reactor Control System.

Acceptance Criteria

The Reactor Control System has been adjusted to provide optimum plant performance without exceeding the requirements of Technical Specification 3.2.5.

28. CALIBRATION OF STEAM AND FEEDWATER FLOW INSTRUMENTATION

Objective

To calibrate the steam and feedwater flow instruments.

Plant Conditions/Prerequisites

Portions of this test will be performed at hot zero power conditions and at selected major power plateaus (30%, 50%, 75% 90% and 100%) as required by the startup test sequence.

Test Method

Permanent plant feedwater flow transmitters will be calibrated using station procedures which are based on laboratory test data. The feedwater flow transmitters will then be used to determine measured flow at all selected power plateaus. To ensure accurate readings, calibration checks will be conducted prior to and following each plateau.

Data will be obtained during the performance of ST-26, Thermal Power Measurement and Statepoint Data Collection, under very stable plant conditions. Data for feedwater and steam flow will be the raw transmitter voltages (1-5VDC). Voltages will be converted to lb_m/hr using the latest individual transmitter scaling, where 5VDC equals 5 X 10^6 lb_m/hr.

Steam flow readings will be compared to the calibrated feedwater flow readings. Adjustments will be made to the steam flow transmitters based on this comparison to obtain a best fit of the data (±2% steam/feedwater flow mismatch at full span).

Acceptance Criteria

The steam and feedwater flow instrumentation has been calibrated.

29. CORE PERFORMANCE EVALUATION

Objective

To provide instructions for obtaining incore movable detector flux and thermocouple maps at power and to verify proper core performance margins.

Plant Conditions/Prerequisites

This test will be performed at selected power plateaus (30%, 50%, 75%, 90%, 100%) as required by the startup test sequence.

Test Method

Flux distribution data will be obtained utilizing the movable detector system. Incore thermocouple data will be obtained using the analog readout instrument or process computer. This data will be analyzed to indicate core performance.

Acceptance Criteria

The flux map results, including DNBR, radial and axial powder peaking factors, and quadrant power tilt, meet the requirements of Technical Specifications 3.2.2, 3.2.4, and 3.2.5.

30. POWER COEFFICIENT MEASUREMENT

Objective

To verify the design prediction of the power coefficient.

Plant Conditions/Prerequisites

This test will be performed at selected power plateaus (30%, 50%, 75%, 100%) as specified by the startup test sequence.

Test Method

Generator load will be varied and data will be collected for ΔT, T_{avg}, and reactor power. Analysis of this data will be correlated to the power coefficient. This inferred actual power coefficient will be compared to the predicted power coefficient.

Acceptance Criteria

The average measured power coefficient verification factor shall be within ±.5°F/% of the predicted power coefficient verification factor.

33. SHUTDOWN FROM OUTSIDE THE CONTROL ROOM

Objective

To demonstrate the capability to shutdown and maintain the reactor in a hot standby condition from outside the control room.

Plant Conditions/Prerequisites

The plant is at a stable power level of equal to or greater than 10% power.

Test Method

The plant will be tripped from a location external to the control room and maintained in the stable hot standby condition for at least 30 minutes. Control will then be transferred back to the control room.

Acceptance Criteria

The plant has been tripped from a location external to the control room. The plant has been maintained in a stable hot standby condition for at least 30 minutes.

34. LOAD SWING TEST

Objective

To verify proper plant response, including automatic control system performance, to 10% step load changes.

Plant Conditions/Prerequisites

This test will be initiated from steady state conditions at selected power plateaus (30%, 50%, 75%, 100%) as required by the startup test sequence.

Test Method

Turbine generator output will be changed as rapidly as possible to achieve an approximate 10% load decrease or increase, as required. Various plant parameters will be recorded or observed during the transient.

Acceptance Criteria

The following criteria will be used to determine successful test completion:

1. Reactor or turbine must not trip.
2. Safety injection is not initiated.
3. Neither steam generator relief valves nor safety valves lift.
4. Neither pressurizer relief valves nor safety valves lift.
5. No manual intervention should be necessary to bring plant conditions to steady state.
6. Plant parameters should not incur sustained or diverging oscillations.
7. Nuclear power overshoot (undershoot) must be less than 3% for load increase (decrease).

Note: Failure to meet these criteria does not constitute a need for stopping the test program, but correction of any deficiencies should be accomplished as required consistent with the plant schedule.

35. LARGE LOAD REDUCTION TEST

Objective

To verify proper plant response, including automatic control system performance, to a 50% load reduction.

Plant Conditions/Prerequisites

This test will be initiated from steady state conditions at the 75% and 100% power plateaus.

Test Method

Turbine generator output will be reduced as rapidly as possible to achieve an approximate 50% load reduction. Various plant parameters will be observed or recorded during the transient.

Acceptance Criteria

The following criteria will be used to determine successful test completion:

1. Reactor or turbine must not trip.
2. Safety injection is not initiated.
3. Steam generator safety valves should not lift.
4. Pressurizer safety valves should not lift.
5. No manual intervention should be necessary to bring plant conditions to steady state.

Note: Failure to meet these criteria does not constitute a need for stopping the test program, but correction of any deficiencies should be accomplished as required consistent with the plant schedule.

36. AXIAL FLUX DIFFERENCE INSTRUMENTATION CALIBRATION

Objective

To determine the relationship between the excore detector currents and incore axial flux difference and to derive the calibration factors for the F(ΔI) component of the ΔT reactor trip setpoints and the ΔI instrumentation.

Plant Conditions/Prerequisites

This test will be performed at the 75% power plateau.

Test Method

The Incore Movable Detector System will be used at various axial offsets to obtain flux distribution data from which axial flux differences can be obtained. This data in conjunction with excore detector current data, taken during the mapping, will generate the incore-excore relationships from which the ΔI instrumentation can be calibrated.

Acceptance Criteria

The relationship between incore axial offset and ΔI has been determined and the ΔI instrumentation has been calibrated.

37. STEAM GENERATOR MOISTURE CARRYOVER MEASUREMENT

Objective

To determine the moisture carryover performance of the steam generators.

Plant Conditions/Prerequisites

This test will be performed at 100% power, as required by the startup test sequence.

Test Method

A tracer will be injected into the steam generator and an analysis of selected water and steam samples will be performed. These results will be used to calculate the steam generator moisture carryover.

Acceptance Criteria

The steam generator moisture carryover has been calculated.

38. UNIT TRIP FROM 100% POWER

Objective

To verify the ability of the plant to sustain a trip from 100% power and return to stable conditions following the transient, and to determine the overall response time of the reactor coolant hot leg resistance temperature detectors (RTD).

Plant Conditions/Prerequisites

This test will be initiated from steady-state conditions at the 100% power plateau.

Test Method

A plant trip will be initiated by tripping the generator main breaker. Plant response will be monitored and plant parameters will be recorded as required. This data will be evaluated to determine if changes in control system settings are required to improve system response.

Acceptance Criteria

The following criteria will be used to determine acceptance:

1. Pressurizer safety valves shall not lift.
2. Steam generator safety valves shall not lift.
3. Safety injection is not initiated.
4. The overall hot leg RTD response time is conservative with respect to the value used in UFSAR Chapter 15.

39. LOSS OF OFFSITE POWER TEST

Objective

To demonstrate starting of emergency diesels and proper sequencing of loads following a main generator trip without an available source of offsite power.

Plant Conditions/Prerequisites

The plant is at a stable power level of equal to or greater than 10% power.

Test Method

Generator output breakers will be tripped resulting in a reactor trip with no offsite power available. The starting of the emergency diesel generators and overall plant response will be monitored.

The loss of offsite power will be maintained long enough for plant systems to stabilize (at least 30 minutes or longer).

Acceptance Criteria

The diesel generators reach rated voltage and frequency within the limits specified in Technical Specifications 4.8.1.1.2a. The emergency power sequencers function as described in UFSAR Section 8.3.

40. NSSS ACCEPTANCE TEST

Objective

To demonstrate reliability of the NSSS at rated power and to measure the NSSS output at its warranted rating.

Plant Conditions/Prerequisites

The plant will be at rated full power.

Test Method

The NSSS will be maintained at its rated thermal output (+0% -5% for a specified period of time to demonstrate reliability. Steady-state conditions will be established as close as possible to warranty conditions and appropriate data recorded to allow determination of plant performance.

Acceptance Criteria

The reliability of the NSSS has been demonstrated by operating at or near full power, as mutually agreed by the owner and NSSS vendor, for a specified period of time, and the NSSS is capable of developing the warranted output as calculated during the performance measurement.

41. RADIATION SURVEY

Objective

To determine dose rate levels at preselected locations throughout the plant, and to identify high radiation areas. To verify operability of selected area radiation monitors.

Plant Conditions/Prerequisites

The plant is at steady state conditions at selected power levels (HZP, 50%, 100%) as specified by the startup test sequence.

Test Method

Radiation surveys will be made during steady-state plant conditions to determine gamma and neutron dose levels at preselected points throughout the plant. The response of area radiation monitors will be compared with the survey readings.

Acceptance Criteria

Neutron and gamma radiation dose levels have been measured at various preselected locations. The response of selected area radiation monitors agrees with values obtained during ST-41. High radiation areas have been identified.

42. WATER CHEMISTRY CONTROL

Objective

To demonstrate that chemical and radiochemical control and analysis systems function as described in the UFSAR and verify that water chemistry requirements can be maintained at various plant conditions.

Plant Conditions/Prerequisites

This test will be performed prior to criticality and at major power plateaus (HZP, 30%, 50%, 75%, 100%) as specified by the startup test sequence.

Test Method

Samples of reactor coolant will be analyzed to verify that primary chemistry requirements can be maintained. During power operation, samples of secondary plant water will also be obtained to verify that chemistry specifications are met. These results will be compared with those from selected analyzers to demonstrate proper operation.

Acceptance Criteria

Control and alarm systems function as described in UFSAR Subsections 9.3.2 and 9.3.4, and water chemistry is maintained within limits established by "Westinghouse Guidelines for Secondary Water Chemistry" and Technical Specifications 3.4.7 and 6.7.4c. Analyzer responses agree with analysis results.

43. PROCESS COMPUTER

Objective

To verify the process computer is receiving correct inputs from process variables and performing related calculations correctly.

Plant Conditions/Prerequisites

This test will be performed at major power plateaus (30%, 50%, 75%, 100%) as specified by the startup test sequence.

Test Method

Computer outputs for various plant parameters will be compared with the values indicated by plant process instrumentation.

Acceptance Criteria

The process computer inputs and process instrumentation agree and the related calculations are being performed correctly.

44. LOOSE PARTS MONITOR

Objective

To obtain baseline data for the Loose Parts Monitoring System (LPMS) and to establish the alert levels for power operation.

Plant Conditions/Prerequisites

This test will be performed prior to initial criticality at cold and hot plant conditions and at selected power plateaus (50%, 100%) as specified by the startup test sequence.

Test Method

Accelerometer data will be obtained at various plant conditions to establish a set of baseline data for the plant. Analysis of this data will be used to verify the proper setting of the alert limits.

Acceptance Criteria

Baseline data has been obtained and the alert limits have been established.

45. PROCESS AND EFFLUENT RADIATION MONITORING SYSTEM

Objective

To demonstrate the proper operation of the Process and Effluent Radiation Monitoring Systems.

Plant Conditions/Prerequisites

This test will be performed at selected power plateaus (HZPL, 50%, 100%) as specified by the startup sequence.

Test Method

The response of various process and effluent monitors including selected airborne radioactivity monitors will be compared to the analysis of actual samples obtained from the specific monitoring points.

Acceptance Criteria

The Process and Effluent Monitoring Systems operate in accordance with the criteria given in UFSAR Section 11.5.

46. VENTILATION SYSTEM OPERABILITY TEST

Objective

To demonstrate the ability of various ventilation and air conditioning systems to maintain proper environmental conditions in various equipment spaces under operating conditions.

Plant Conditions/Prerequisites

This test will be performed at the 50% and 100% power plateaus.

Test Method

Ambient temperatures will be monitored in selected plant location including areas containing engineered safety feature equipment to ensure proper environmental conditions are maintained.

Acceptance Criteria

The ventilation systems are capable of maintaining equipment space environmental conditions as described in UFSAR Section 9.4.

48. TURBINE GENERATOR STARTUP TEST

Objective

To provide instructions for the initial startup and synchronization of the turbine generator and to obtain operational data for the turbine generator during the initial startup and at various loads.

Plant Conditions/Prerequisites

Portions of this test will be performed at selected power plateaus (10%, 30%, 50%, 75%, 100%) as specified by the startup sequence.

Test Method

Detailed instructions will be provided for the initial startup and synchronization of the turbine generator. Data will be recorded for the various turbine parameters during the startup and through the power ascension.

Acceptance Criteria

The turbine generator is synchronized to the grid. Operational data has been collected as specified by ST-48.

50. MOVABLE INCORE DETECTOR SYSTEM

Objective

To verify proper installation and operation of the Movable Incore Detector System.

Plant Conditions/Prerequisites

Prior to initial criticality and during low power physics testing.

Test Method

Testing will be performed on the Movable Incore Detector System to verify system performance in all modes of operation. System indexing will be checked using a dummy cable. The system will be operationally checked to ensure free detector passage in all thimbles. The final limit switch settings will be made during initial core flux mapping.

Acceptance Criteria

The Movable Incore Detector System has been demonstrated operational and meets Technical Specification 3.3.3.2.