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AUTH.NAME AUTHOR AFFILIATION
SORENSEN,G.C. Washington Public Power Supply System
RECIP.NAME RECIPIENT AFFILIATION
SCHWENCER,A. Licensing Branch 2

Revised by P.S. 12-21-83

SUBJECT: Forwards updated Chapter 14.2, "Sys Lineup Preoperational & Initial Startup Test Program," Info will be included in Amend 34 to FSAR.

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Washington Public Power Supply System

P.O. Box 968 3000 George Washington Way Richland, Washington 99352 (509) 372-5000

December 9, 1983
G02-83-1135

Docket No. 50-397

Director of Nuclear Reactor Regulation
Attention: Mr. A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Schwencer:

Subject: NUCLEAR PROJECT NO. 2
INITIAL TEST PROGRAM, FSAR CHAPTER 14.2

Chapter 14.2 of the FSAR will be updated in FSAR Amendment No. 34 to reflect the Startup Power Ascension Test Program. Attached is a copy of the update. Should you have any questions, please contact Mr. P. L. Powell, Manager, WNP-2 Licensing.

Very truly yours,

GC Sorensen

G. C. Sorensen, Manager
Regulatory Programs

tmh
Attachment

cc: R Auluck - NRC
WS Chin - BPA
AD Toth - NRC Site

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50-397 Superseded pages Per Amend 34 to FSAR Sec 14.2
w/ltr 83/12/09
8312190114

Revised by P.S. 12-21-83

14.2 SYSTEM LINEUP, PREOPERATIONAL, AND INITIAL STARTUP TEST PROGRAM

The initial test program consists of a series of tests categorized as system lineup testing, preoperational, and initial startup tests. The system lineup testing determines correct installation and functional operability of equipment. Preoperational tests are those tests normally conducted prior to fuel loading to demonstrate the capability of plant systems to meet performance requirements. Initial startup tests begin with fuel loading and demonstrate the capability of the integrated plant to meet performance requirements.

14.2.1 SUMMARY OF TEST PROGRAM AND OBJECTIVES

14.2.1.1 Initial Test Program Objectives

The objectives of the initial test program are:

a. to ensure that the construction is complete and acceptable;

b. to demonstrate the capability of structures, components, and systems to meet performance requirements;

c. to effect fuel loading in a safe manner;

d. to demonstrate, where practical, that the plant is capable of withstanding anticipated transients and postulated accidents;

e. to evaluate and demonstrate, to the extent possible, plant operating procedures to provide assurance that the operating group is knowledgeable about the plant and procedures and fully prepared to operate the facility in a safe manner; and

f. to bring the plant to rated capacity and sustained power operation.

14.2.1.2 Initial Test Program Summaries

The three categories of tests in the initial test program are summarized below:

a. System lineup tests such as pump and valve tests, mechanical actuation to verify proper installation, and electrical continuity verifications, are those tests which demonstrate that components are correctly installed and operational.

b. Preoperational tests are conducted prior to fuel loading to demonstrate that the plant systems have been properly designed and that they meet performance requirements.

c. Startup tests consist of fuel loading, precritical tests, low power tests, and power ascension tests that ensure fuel loading in a safe manner, confirm the design bases, demonstrate where practical that the plant is capable of withstanding the anticipated transients and postulated accidents, and ensure that the plant is safely brought to rated capacity and sustained power operation.

14.2.1.3 Description of System Lineup Tests

Typical system lineup tests generally include but are not limited to the following:

a. chemcial cleaning and flushing of systems, tanks and vessels;

b. electrical equipment test to, and including, energizing, e.g., checking grounding, relay checks, checking circuit breaker operation and controls, continuity checks, megger tests, phasing check, high potential measurements, and energizing of buses;

c. initial adjustment and bumping of motors;

d. checking control and interlock functions of instruments, relays, and control devices;

e. calibrating instruments and checking or setting initial trip setpoints;

f. pneumatic testing of instruments and service air system and cleanout of lines;

g. checking and adjusting relief and safety valves;

h. complete tests of safety-related motor-operated valves including adjusting torque switches and limit switches, checking all interlocks and controls, measuring motor current and operating speed, and checking leaktightness of stem packing and valve seat during hydrotests; and complete tests of NSSS control systems including checking all interlocks and controls, adjusting limit switches, measuring operating speed, checking leaktightness of pneumatic operators, and checking for proper operation of controllers, pilot solenoids, etc.; and

i. other tests and verifications such as structural; leaktightness; and vibration.

14.2.1.4 Description of Preoperational Tests

A listing of the preoperational tests, together with subsection and page references for each, follows as Table 14.2-1. The general objectives of the preoperational test phase are as follows:

a. ensure that test acceptance criteria are met;

b. provide documentation of the performance and safety of equipment and systems;

c. provide baseline test and operating data on equipment and systems for future reference;

d. run-in new equipment for a sufficient period so that any design, manufacturing, or installation defects can be detected and corrected;

e. ensure that plant systems operate together on an integrated basis to the extent possible;

f. give maximum opportunity to the permanent plant operating staff to obtain practical experience in the operation and maintenance of equipment and systems;

g. establish safe and efficient normal, abnormal and emergency operating procedures, to the extent possible;

h. establish and evaluate surveillance testing procedures; and

i. demonstrate that systems and safety equipment are operational and that it is possible to proceed to fuel loading and to the Startup Phase.

14.2.1.5 Description of Startup Tests

After the Preoperational Test Phase has been completed, the Startup Phase begins. The Startup Phase begins with fuel loading and extends to commercial operation. This phase is subdivided into the following four parts:

a. Fuel loading and shutdown power level tests

b. Power testing from 0 to 25 percent of rated output

c. Power testing from 25 to 100 percent of rated output

d. Warranty demonstration

The tests conducted during the Startup Phase consist of Major Plant Transients (Table 14.2-2), Stability Tests (Table 14.2-3), and a remainder of tests which are directed towards demonstrating correct performance of the nuclear boiler and numerous auxiliary plant systems while at power. Certain tests may be identified with more than one class of test. Table 14.2-4 shows the complete Startup Test Program.

The general objectives of the Startup Phase are as follows:

a. to achieve an orderly and safe initial core loading;

b. to accomplish all testing and measurements necessary to determine that the approach to initial criticality and subsequent power ascension is safe and orderly;

c. to conduct low power physics tests sufficient to ensure that test acceptance criteria have been met;

d. to conduct initial heatup and hot functional testing so that hot integrated operation of all systems is shown to meet test acceptance criteria;

e. to conduct an orderly and safe power ascension program, with requisite physics and systems testing, to ensure that the plant operating at power meets test acceptance criteria; and

f. to conduct a successful warranty demonstration program.

14.2.2 ORGANIZATION AND STAFFING

14.2.2.1 General

The WPPSS Test and Startup Program is administered by two entities with distinct levels of responsibility. The Test Working Group provides review, approval and planning of general Test and Startup Program activities and the results of those activities. The Test and Startup Department and qualified members of other organizations represented on the Test Working Group provide the necessary development, implementation and analysis of Test and Startup Program activities at the working level.

14.2.2.2 Definitions

The definitions of phrases used in this section and throughout this chapter are as follows:

a. Test Working Group (TWG) - a project on-site administrative body whose membership consists of personnel representing organizations directly responsible for preparation and performance of testing and startup. This group provides review and approval of test preparation and performance activities.

b. Test and Startup Program Division - a WPPSS division in the Generations Group with responsibility for development and implementation of the Test and Startup Program. A Test and Startup Department for each project is organized within this division.

c. Plant Organization - a WPPSS division in the Generations Group with responsibility to operate and maintain a Washington Public Power Supply System power plant in compliance with Federal, State, local and owner requirements.

d. Plant Operations Committee (POC) - refer to definition in 13.4.1.

e. Startup Superintendent - the Test and Startup Department Manager with responsibility for implementation of the Test and Startup Program.

f. Test and Startup Program - that program which encompasses the transition from construction to commercial operation and consists of system lineup testing, preoperational testing and startup testing.

g. Test and Startup Program Manual - the manual that defines generic administrative policy and procedures for the initial testing and startup of WPPSS nuclear facilities.

h. Test and Startup Instructions - the specific instructions required to implement the Test and Startup Program for an individual project.

14.2.2.3 Test and Startup Program Division

14.2.2.3.1 General

Test and Startup Programs is a division in the Generation Group. Relative to the Program, the Test and Startup Program Division is responsible for development and administration of plans, policies, and administrative procedures, procurement of test equipment and other test-related resources, and assignment of the Startup Superintendent for the project. The Test and Startup Program Division organization and its relationship to other WPPSS departments is shown in Figure 14.2.1.

14.2.2.3.2 Responsibilities of Test and Startup Department

WNP-2 Test and Startup is a department of the Test and Startup Program Division. The manager of this department, the Startup Superintendent supervises an organization comprised of WPPSS test engineers and test technicians augmented by test personnel from the architect-engineer, the nuclear steam supply system supplier, and others as contractually established for the project. The Startup Superintendent is responsible for the development and implementation of the Test and Startup program for the project. His responsibilities are described in 14.2.2.3.3. The Test and Startup staff organization is shown in Figure 14.2-2.

14.2.2.3.3 Test and Startup Department Position Responsibilities

14.2.2.3.3.1 Startup Superintendent

a. Chairman, Test Working Group

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

c. Administer and coordinate the testing activities with other organizations involved in the test and startup program.

d. Manage and direct assigned test personnel in activities relating to the attainment of test and startup program objectives.

e. Manage and direct assigned test personnel to establish qualitative and quantitative acceptance criteria and develop test procedures to direct and guide performance of testing.

f. Provide recommendations and effect actions to eliminate equipment or system deficiencies as determined by test and startup program criteria which could adversely affect performance of safety-related functions.

14.2.2.3.3.2 Test Group Supervisor

a. Supervise the activities of assigned Test Engineers.

b. Review and, where appropriate, approve test procedures, field changes to procedures and test results and make recommendations to the Startup Superintendent.

c. Set schedules and priorities for assigned Test Engineers and assist them with problem resolution.

d. With other Test Group Supervisors and the Startup Superintendent, plan and coordinate Startup activities and provide assistance.

e. Advise the Startup Superintendent on all matters concerning testing within their group and, if required, attend TWG meetings for this purpose.

f. Act for the Startup Superintendent when so delegated.

g. Prepare for and perform testing as required to support the Test and Startup Program.

h. Coordinate the identification and documentation of design problems and their resolution.

i. Perform the supervision necessary in the direct preparation of documents required for implementation of the Test and Startup Program.

j. Assign system responsibilities to individual Test Engineers assigned to that group.

BLANK

14.2.2.3.3.3 Test Engineers

Within the category of Test Engineer, the Test Group Supervisor assumes the lead technical responsibility for the testing within a particular discipline or area. The Test Engineers provide for the routine development and implementation of testing. The general Test Engineer duties are as follows:

a. Prepare assigned test procedures.

b. Review tests and inspections prepared by others for application to assigned testing responsibilities.

c. Provide direction during performance of system and component testing.

d. Identify problem areas and recommend actions where deficiencies could adversely affect performance of safety related functions or operating efficiency.

14.2.2.4 DELETED

14.2.2.5 Test Working Group (TWG)

14.2.2.5.1 Purpose of the Test Working Group

The purpose of the Test Working Group, a composite of representatives from organizations directly responsible for preparation, performance, and review of Test and Startup Program activities, is to provide a means for a coordinated review of all testing concerns and assuring all obligations to the Test and Startup Program are met by the organizations represented.

The Test Working Group provides review and approval of all activities proposed and the results thereof as appropriate. All decisions and approvals or recommendations of the Group are signified in the minutes of the meetings. Matters requiring approval by the Test Working Group include, but are not limited to:

a. System lineup procedures

b. Test procedures

c. Changes to test procedures

d. Results of testing

14.2.2.5.2 Membership and Responsibility of the Test Working Group

The TWG membership consists of the following representatives: as long as that member's organization has a direct support function for the current phase of testing or phase for which testing is to be developed.

The Startup Superintendent is Chairman of the TWG and is responsible to convene and conduct TWG meetings and achieve agreement from its membership on the administrative and technical content of program activities.

The Operations Superintendent is responsible for providing an operational review of test documents and for submitting safety-related documents to the Plant Operations Committee for review and for communicating the Committee's decisions to the TWG. He provides detailed plant operating procedures and surveillance procedures to be used for plant operation and testing during the Test and Startup Program.

The Operations Q.A. representative to the project shall be responsible for review of proposed activities, test procedures and test results per the requirements of the Operational Assurance Program description.

The Project Engineering representative is responsible for obtaining a technical review of proposed activities and test documents by assigned project engineers and for representing Project Management's concern in the Test and Startup Program.

Conditional Members are representative of any organization having responsibility and/or expertise in the area of the TWG meeting agenda. In this situation the representative will be requested to attend the meeting by the TWG chairman.

14.2.2.6 Plant Organization Functions and Responsibilities

The plant organization has overall responsibility for the safe and efficient operation of plant systems and equipment, from provisional acceptance through commercial operation including responsibility for maintenance and operational control. Plant organization responsibilities in supporting the Test and Startup Program are discussed in 14.2.2.7.1 below.

The responsibility of the plant organization representative to the Test Working Group is as defined in 14.2.2.5.2.

14.2.2.7 WPPSS Support of the Test and Startup Program

14.2.2.7.1 Plant Organization

In addition to the responsibilities described in 14.2.2.6, the plant operating, technical, and maintenance sections provide manpower for development, implementation, and review of testing.

14.2.2.7.1.1 Support During Test and Startup Program Development

Assistance during the development of the Test and Startup Program is provided formally through the plant organization's Test Working Group representative. Input to test procedures and other testing documentation by the plant staff assures:

a. That the operational requirements of test procedures are based on the knowledge and experience of the operating staff.

b. That the technical considerations receive the review of the Plant Technical Staff.

c. That important nuclear and operational safety considerations receive attention by the Plant organization.

14.2.2.7.1.2 Support During Testing

Detailed review and analysis of test results will be performed by the plant technical section and/or plant operations section where their particular expertise is deemed necessary by the plant representative to the TWG to support approvals of completed tests.

14.2.2.7.2 Project Division

The WNP-2 Project Division is responsible for the performance of the organizations involved in the design, procurement, and construction of generating projects. The Project Division Manager supports the Test and Startup Program by providing and implementing project control systems, project engineering services, and engineering support services.

The WPPSS Project Manager supports the Test and Startup Program by maintaining a high level of current status information available to the Startup Program Organizations to assure that all startup program scheduling and preparation is based on an accurate assessment of the condition of systems and equipment being readied for testing. The Project Manager provides liaison with Construction Management for the provision of construction craft support for the implementation of various system lineup and preoperational tests.

14.2.2.7.3 Quality Assurance Division

The functions of the Quality Assurance organization during the Test and Startup Program will be to survey ongoing efforts to determine that the controls required by various regulations, guides, and standards are effectively implemented. The activities of the Test Working Group will be monitored to assure that the proper degrees of control for safety related activities are being maintained and that required activities are completed where they are prerequisite to another testing activity.

14.2.2.8 Architect-Engineer Support of the Test and Startup Program

Burns and Roe, Inc. is responsible to provide information required to assure timely completion of construction testing and equipment turnover for provisional acceptance. Burns and Roe also provides system-oriented engineers to assist the

WPPSS Test and Startup Department, as requested by WPPSS, in the provision of system boundary definitions, a preoperational test index prepared by WPPSS and technical direction and/or advice and consultation during system and component testing through preoperational testing.

14.2.2.9 General Electric Company Support of the Test and Startup Program

The General Electric Company (GE) is the supplier of the BWR nuclear steam supply system (NSSS) for WNP-2. GE is responsible for generic and specific WNP-2 designs and for the supply of the NSSS. During the construction phase of the plant cycle the GE Resident Site Manager is responsible for all NSSS equipment disposition. When the testing phase of the project begins, the responsibility of GE-NSSS activities are assigned to Preoperational and Startup Group. The GE Preoperational and Startup staff responsibilities are outlined below.

14.2.2.9.1 Staff Responsibilities

14.2.2.9.1.1 GE Operations Manager

The GE Operations Manager is the senior NSSS vendor representative onsite at or near official fuel loading, and is the official site spokesman for GE for preoperational and startup testing. He coordinates with the Startup Superintendent for the performance of his duties which are as follows:

a. reviewing all NSSS test procedures, including changes to test procedures, and test results as a conditional member of TWG.

b. providing technical direction to the station staff;

c. managing the activities of the GE site personnel in providing technical direction to WNP-2 personnel in the testing and operation of GE supplied systems;

d. providing liaison between the site and the GE San Jose home office to provide rapid and effective solution to problems which cannot be solved onsite; and

e. participating as a conditional member of the Test Work Group when required.

14.2.2.9.1.2 GE Operations Superintendent

The GE Operations Superintendent is responsible to the GE Operations Manager for supervising the activities of GE Shift Superintendents. He works directly with the WNP-2 Operations Supervisor in providing GE technical direction to the operating organization.

14.2.2.9.1.3 GE Shift Superintendents

The GE Shift Superintendents provide technical direction to WNP-2 shift personnel in the testing and operation of GE supplied systems. They provide 24-hour per day shift coverage as required beginning with fuel loading. They report to the GE Operations Superintendent.

14.2.2.9.1.4 GE Lead Engineer - Startup Test, Design, and Analysis

The GE Lead Engineer - Startup Test, Design, and Analysis is responsible to the GE Operations Manager for supervising the GE shift engineers and for verifying core physics parameters and characteristics and documenting that performance of the NSSS and components conform to test acceptance criteria.

He works with the WNP-2 Technical Supervisor to coordinate and effect implementation of the Startup Test Program instrumentation including special test equipment required to confirm these acceptance criteria.

14.2.2.10 Qualifications of Personnel Supporting the Test and Startup Program

The qualifications described in this section are for those persons having authority to direct testing, review and approve test documentation and results or otherwise have direct influence on the conduct of testing and quality of acquired data. Although other personnel, specifically GE, Burns and Roe, and WPPSS technical specialists, are also involved in these processes, they are under the direction of individuals whose qualifications are described herein and who review and approve all test and startup program activities.

14.2.2.10.1 Test and Startup Program Department Personnel Qualifications

a. At the time of appointment to the active position, the Startup Superintendent shall have ten years of responsible thermal power plant experience such as, but not limited to, managerial, technical, or administrative positions, of which a minimum of three years shall be nuclear power plant experience. A maximum of four years of the remaining seven years of experience may be fulfilled by academic training on a one-to-one time basis. This academic training shall be in engineering or the individual shall have acquired the experience and training normally required for examination by NRC for a senior operator license whether or not the examination is taken.

b. Minimum qualifications for Test Group Supervisor are a Bachelor of Science degree in Engineering or related field and five (5) years of applicable experience, at least three of which are in testing or operation of nuclear power generation, propulsion, or similar scale test or production facilities. Related experience may be substituted for academic requirements when the candidate's professional background and level of achievement clearly demonstrate capabilities to fill the position. Previous preoperational testing experience is required. A good understanding of Quality Assurance and regulatory requirements and an ability to effectively communicate with others are necessities. A demonstrated technical leadership in his discipline and necessary work experience at the Senior Test Engineer or equivalent level is evidence of required proficiency.

c. Minimum qualifications for a Test Engineer directing preoperational tests are a Bachelor of Science degree in Engineering or related field or a graduate of a technical or vocational school in an Engineering or related field and two years related experience. Related experience above the required minimum may be substituted for academic requirements when the candidate's record for performance clearly indicates the ability to fill

the position without question. A good understanding of enginering principles and the ability to understand new concepts and to effectively communicate with others is a necesity.

Minimum requirements for a Test Engineer directing startup tests are a Bachelor of Science degree in Engineering or related field and two years of related experience or, a graduate of a technical or vocational school in an Engineering or related field and three years related experience. Related experience above the required minimum may be substituted for academic requirements when the candidate's record for performance clearly indicates the ability to fill the position without question. A good understanding of engineering principles and the ability to understand new concepts and to effectively communicate with others is a necessity.

14.2.2.10.2 Plant Organization Personnel Qualifications

Qualifications of the Plant Manager, Operation Superintendent, technical sections engineers, and operations supervision are found in 13.1.3.1.

14.2.2.10.3 DELETED

14.2.2.10.4 DELETED

14.2.3 TEST PROCEDURES

14.2.3.1 Development of Test Procedures

WPPSS -

Test Procedures are developed by the Test and Startup Department to provide a detailed method to demonstrate the capability of the system to perform its design function under anticipated operating and accident condition.

General Electric Company -

General Electric Company as supplier of the NSSS provides test program specifications and instructions from which WPPSS prepares the preoperational and initial startup test procedures for systems supplied by GE.

AE and Vendors -

Technical assistance is provided by Burns and Roe and vendor technical representatives as deemed necessary.

14.2.3.1.1 DELETED

14.2.3.1.2 Incorporation of Plant Procedures

The following program will be implemented on WNP-2 to utilize and qualify plant operating procedures during testing.

a. Plant Procedures will have been prepared in at least draft form before preoperational testing begins using the best information currently available from the principal designer and responsible equipment suppliers.

b. Preoperational Test Procedures will resemble plant operating and emergency procedures as nearly as possible.

c. Utilizing the results of preoperational testing, including the use-testing of plant procedures where practical, the plant procedures will be updated and approved before the startup testing phase. Exceptions to this program will be those approved plant procedures required to be verified during the startup phase.

d. Simultaneous with the updating of Plant Procedures, Startup Test Procedures will be either updated, if already drafted, or developed, utilizing the results of preoperational testing.

14.2.3.1.3 Format of Test Procedures

The minimum content requirements for WNP-2 Preoperational and Startup Test Procedures are specified in the generic WPPSS Test and Startup Program Manual. The format for WNP-2 test procedures is specified in the WNP-2 Test and Startup Program Manual. The resulting format and content is described below.

a. Preoperational and Startup Test Procedure Format

1) Purpose

A concise description of the objectives of the test, including such test requirements as component functions to be checked and testing under normal or simulated conditions to verify readiness for system startup and operation, and system tests to confirm that the performance of the system is in compliance with all applicable design requirements.

2) Prerequisites

Provisions necessary for performance of the test. Conditions that should exist prior to start of the test. Instructions given to identify required operational status of the plant and interfacing systems, environmental conditions, and individual component status requirements, including verification of the following:

i. Components being tested have been provisionally accepted and open deficiencies will not affect the performance of the test.

ii. System lineup testing on components included in the test is complete.

iii. Necessary support systems are available.

3) Limits and Precautions

Special precautions required for safety of personnel and equipment, or needed to assure a meaningful test and satisfactory performance of testing.

4) Special Equipment

A list of special material and equipment for the performance of the test.

5) Procedure

A step by step procedure for performing the test. Plant operating procedures will be utilized whenever practicable for the operation of systems and equipment during testing and for returning the system to normal after completion of testing. Abnormal procedures will be utilized as required to supplement normal plant operating procedures. Data collection will be part of the procedure steps.

6) Restoration

Includes those steps necessary to return the system to a normal operating or tagged status. This may include removal of special test instruments, temporary equipment, electrical jumpers, valve lineups, etc.

7) Acceptance Criteria

The criteria against which the success or failure of the test will be judged must be identified. In some instances, these will be qualitative criteria, given event does or does not occur. In other cases, quantitative values can be designated as acceptance criteria.

1. All quantitative acceptance criteria shall include suitable tolerances.

2. A readily apparent correlation should exist enabling a reviewer to cross-reference among procedure steps, data and acceptance criteria.

8) References

A listing of all material required for the preparation and performance of the test. This should include piping and instrumentation drawings, electrical elementary drawings, vendor instruction manuals, applicable FSAR sections, contract specifications, and applicable codes, standards or guides, and applicable plant procedures.

14.2.3.2 Review of Test Procedures

Each member of the Test Working Group will provide for review of test procedures with respect to that member's organizational area of responsibility. Startup test procedures will be reviewed by the Plant Operations Committee.

Comments submitted by Test Working Group members will be evaluated by the Test Working Group and the test procedure revised accordingly. After discussion of the resulting version, the decision to reject, accept or accept with modification, will be obtained by consensus of the membership of the TWG. In the event the TWG cannot reach a consensus, the Chairman shall provide resolution or a method for resolving the issue to the appropriate division management for review and concurrence.

The results of the Plant Operations Committee review of Startup Test Procedures will be approved by the Plant Manager.

The qualifications of the individuals or organization representatives reviewing test procedures are described in 14.2.2.10. The qualificatons of POC members are described in 13.1.3.1.

The administrative procedures governing the test procedure review process are contained in the WNP-2 Test and Startup Program Manual. These procedures cover the mechanism of review and comment resolution, documentation of this review and method of indication of the review status of a test procedure.

14.2.3.3 Approval of Test Procedures

Test procedures will be approved by the Test Working Group Chairman by means of consensus of the TWG membership after review of the test procedure as described in 14.2.3.2. Startup test procedures will be approved by the Plant Operating Committee in a similar manner.

Indication of approval of individual test procedures will be evidenced by the signatures of the chairmen of the Test Working Group and Plant Operations Committee, as required. Evidence of the consensus of these two committees supporting their respective chairmens' signatures of approval will be contained in the minutes of the groups' meetings.

The administrative procedures governing the exercise of approval of test procedures are contained in the WNP-2 Test and Startup Program Manual.

14.2.4 CONDUCT OF TEST PROGRAM

14.2.4.1 Administrative Procedures for Preoperational Testing

14.2.4.1.1 Test Performance Authorization

A significant period of time may have elapsed between the time a preoperational test procedure was approved and the time a test is to be performed. The test procedure is therefore reviewed just prior to initiating the test. Any changes in the system since original approval of the test procedure will be thoroughly researched and the test procedure revised and approved in accordance with 14.2.3.2 and 14.2.3.3. The Startup Superintendent will then approve the test procedure for performance of the test.

14.2.4.1.2 Preoperational Test Prerequisites

Approval by the Startup Superintendent to perform a preoperational test also requires consideration of the prerequisite testing required to qualify components and systems for operation. In general, completion of the system lineup testing (see 14.2.1.3) will qualify the system for preoperational testing. System Lineup testing, as a prerequisite to Preoperational testing, will include:

a. Instrumentation and protective relay checks, including calibration, setpoint adjustments, logic verification and line checks;

b. Component operability checks, including valve stroking, motor rotation, ventilation system balancing, rotating equipment run-in and pipe support inspection and adjustment;

c. Flushing, including proof flushes, flow instrumentation response, and pump performance and capacity checks;

d. Electric component and system checks, including breaker trip setpoints;

e. Hydrostatic or pneumatic pressure tests on systems where dynamic testing, such as pump runs, are required to allow performance of pressure tests. Pressure integrity tests are otherwise performed during construction testing.

Verification that system lineup tests have been successfully completed will be contained in an information package which is reviewed by the Startup Program Manager prior to recommending turnover of a system or component from a contractor to WPPSS. Verification that the system is actually ready for preoperational testing will be performed as described in 14.2.4.3.

14.2.4.1.3 Conduct of Preoperational Testing

a. Implementation responsibilities for scheduling all tests are assigned to the Startup Superintendent. The Test Working Group will be kept informed of the scheduled activities.

b. The satisfaction of prerequisites to commencement of the test, as indicated in the test procedure, will be verified by the test engineer prior to performance of the test.

c. The assigned test engineer is responsible for directing the performance of each test. Testing is performed in direct coordination between the test engineer and shift supervision.

d. All testing will be conducted in accordance with approved test procedures. If, during the performance of a test, it is found that the procedure is unacceptable for some reason, the test engineer can propose changes by use of a "Test Change Notice" (see 14.2.4.4). This provides both documentation of the change and confirmation by the Test Working Group.

e. All test data will be entered on the official copy of the test procedure.

14.2.4.1.4 Deficiency Reporting

Deficiencies or discrepancies identified during testing will be reported individually as described in 14.2.5.2.

Corrective action or satisfactory disposition shall be taken on all deficiencies and discrepancies in equipment and procedures prior to final approval of the preoperational test results. All deficiencies or discrepancies identified during the test, or which have not been resolved upon completion of the test, will be recorded in the official copy of the preoperational test.

14.2.4.1.5 Equipment Maintenance and Modifications During Preoperation Testing

Modifications or repair to safety related systems will be implemented as a result of a formal system of problem and deviation reporting. Disposition of problems requiring mechanical or electrical changes or repairs by Contractors will be implemented by work requests.

a. Startup Problem Reports (SPR), Startup Deficiency Reports (SDR) and Startup Work Requests (SWR) are administered through closed-loop procedural controls to assure resolutions. A completed SPR, SDR and SWR is approved for closure by the Startup Superintendent.

b. Startup Problem Reports (SPR) are used to report design deficiencies and are coordinated by the WPPSS Project Engineering Division for resolution by the original design organization or qualified alternate. The SPR's are reviewed by Project Engineering and a Project Engineering Directive (PED) is issued to define plant modifications or changes that are required. A Startup Work Request (SWR) is then issued to perform the plant modification by Contractor personnel or a Startup Deficiency Report is issued to defer the work or have it performed by Startup personnel.

c. Startup Deficiency Reports (SDR) are used to report and track non-design related deficiencies. If required, an SWR will be issued to perform the repair work to resolve the non-design related deficiency, by Contractor personnel. Work accomplished by Startup personnel can be accomplished by the SDR without issuing an SWR.

d. Retest requirements will be identified on the SWR or SDR and attached to, or referenced by work request number in test files.

e. Startup Problem and Deficiency Reports, Startup Work Requests, design change documentation, retest results, and procurement records for safety related systems will be filed in assembled packages or with appropriate cross referencing for retrievability.

14.2.4.1.6 Preoperational Test Summary

Upon completion of the preoperational test, the test engineer will prepare a test report which includes a summary of the conduct of the test, and evaluation of the test results with reference to the acceptance criteria, and a description of problems encountered and corrective actions taken or proposed. This report will be attached to the official copy of the test.

14.2.4.1.7 Evaluation of Preoperational Test Data

Upon completion of the test, a copy of the official test procedure, data, the test summary, and other applicable attachments will be transmitted to each member of the Test Working Group responsible for review.

14.2.4.1.8 Preoperational Test Records

The Startup Superintendent will maintain all official test records (the copy of the test procedure containing the original test data and signatures and all attachments) until completion of the test program. See 14.2.6 for details of the test records handling and retention program.

14.2.4.2 Administrative Procedures for Startup Testing

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14.2.4.2.1 Plant Operation During Startup Testing

During initial startup tests and operations, the plant procedures are followed except as specifically modified by approved test procedures. In addition, special safety precautions and limitations are included in the test procedures. Approved test procedures will be used to control test conditions outside of Plant Technical Specification Limits where allowed for test purposes.

Certain individual tests or power escalations may require authorization by both the Plant Operating Committee and the Plant Manager immediately prior to implementation and will be so identified in the applicable test procedure.

The final authority to start or continue a test is the responsibility of the shift supervisor after all previous approvals have been exercised. Testing is performed in direct coordination between the test engineer and shift supervisor.

14.2.4.2.2 Startup Test Scheduling and Sequencing

Scheduling and sequencing of testing during startup is performed under the direction of the Plant Manager.

The startup or power escalation test sequence is described in terms of individual test evolutions and specific power plateaus due to interfaces with other simultaneous tests, requirements for continuous data review and plant administrative requirements for authorization to proceed or continue. The test sequence identifies hold points for data review and authorization to proceed and establishes the general plant conditions for each group of tests.

14.2.4.2.3 Startup Test Performance

Before starting each test, the assigned test engineer will review the test procedure to assure that prerequisite activities or conditions have been satisfied as described in 14.2.4.3.

The test will be stopped or curtailed if it cannot be performed safely or in accordance with the approved test procedure. Required test procedure deviations or changes may be effected in accordance with a "Test Change Notice" as described in 14.2.4.4.

Should apparent deviations of test results from performance requirements or acceptance criteria be revealed, or should other apparent anomalies develop, the plant will be placed in a safe condition and relevant test data reviewed by the test engineer and Shift Supervisor. If the apparent discrepancy or anomaly is substantiated, the situation will be reviewed by the Plant Operations Committee to ascertain if a plant safety question is involved. Control of any identified nonconformance or noncompliance will be in accordance with the plant administrative procedures.

Evaluation of the effect of the discrepancy or anomaly on plant safety will be performed at the appropriate level of review and appropriate corrective actions will be taken before resumption of the test or test conditions at which the problem was revealed.

At the completion of an entire test procedure, the test engineer will assemble all of the data and supporting information, nonconformance documentation and test results evaluations for review by the Plant Operating Committee. Any data reduction or analysis required will be done as soon after the data is available as is practical so that the results of the analysis may be included in the completed test package.

Test records will be maintained as described in 14.2.6.

14.2.4.3 Control of Test Prerequisites

Conditions and activities prerequisite to a given test will be identified in the applicable test procedure. Prior to commencement of the particular test, the test engineer will verify that the identified prerequisites, as described below, have been satisfied. The verifications will be recorded and retained as part of the test record.

The test engineer will verify that:

a. The test procedure has been approved by the appropriate committee and Plant Manager or Startup Superintendent as required. The test procedure is compatible with the latest versions of material referenced in the test procedure.

b. The official working copy of the test procedure is identical to that contained in the master file, including the latest TWG/POC approved revisions or test procedure field changes (see 14.2.4.4).

c. Prerequisite tests have been completed. If TWG and/or Plant Superintendent approval of the completed test is also a prerequisite that approval will have been obtained.

d. The test procedure has been made available for shift operator review and familiarization. Operator support has been scheduled, as necessary.

e. Test equipment is available or in place as required. Calibration or other readiness requirements have been completed. System instrumentation to be used in the test has been calibrated within the required time period established for surveillance testing and/or preventative maintenance.

f. Test and operating personnel involved in the performance of the test have been briefed immediately prior to starting the test.

14.2.4.4 Modification of Test Procedures During Testing

The Test and Startup Program Manual provides a means of controlling modifications to TWG-approved test procedures during testing. This administrative procedure, contained in the WNP-2 Test and Startup Program Manual, applies to changes made to an approved test procedure during preoperational and startup testing. The procedure does not apply to revisions made during the preparation of test procedures.

The procedure provides control of revisions which change the intent or the acceptance criteria of the test procedure.

The required changes, when identified by the responsible test engineer, are described on a special form (Test Change Notice/Procedure Change Notice) which identifies the affected test procedure or plant procedure, justifies the change, and contains spaces for the appropriate approvals.

A Test Change Notice for a Preoperational test is reviewed by the TWG and approved by the Startup Superintendent, TWG Chairman.

The Test Change Notice for a Startup Test is approved by the POC and Plant Manager prior to implementation.

The Test Change Notice forms a permanent part of the test record.

14.2.5 REVIEW, EVALUATION AND APPROVAL OF TEST RESULTS

14.2.5.1 Control of Test Results Review

The individuals responsible for reviewing the results of particular tests will be designated by the Startup Superintendent. These reviews will be obtained through TWG members in accordance with their represented areas of responsibility. TWG members will provide names of individuals in their represented organizations who meet the requirements of Regulatory Guide 1.58 - November 1973, for evaluation of inspection and test results.

Based on the recommendations of the qualified reviewers, the completed test will be approved by the TWG. POC review and Plant Superintendent approval of startup test results is required.

14.2.5.2 Design Organization Participation in Problem Resolution

Failures of tests to meet acceptance criteria and other problems discovered in the course of testing will be documented as deficiencies in accordance with the requirements of the Test and Startup Program Manual. Reports of such deficiencies will indicate the parties or organizations deemed responsible for providing an acceptable resolution of the deficiency. The responsible organization will be requested to provide a resolution of the defined problem.

Documentation of the final resolution will include the recommendation of the responsible organization and a description of the measures implemented in accordance with that recommendation. Design problems will require resolution by the appropriate WPPSS Technical Division Department, Project Engineering, Plant Technical Staff or original design organization, depending upon the technical nature of the problem.

14.2.5.3 Results Analysis Prerequisites to Continuation of Startup Testing

The Plant Operating Committee will establish prerequisites for various tests, test conditions and test phases in consideration of system or component qualification for subsequent testing.

The control of prerequisites to an individual test will be as described in 14.2.4.3.

The POC will also require an evaluation of the data acquired during a particular test phase or plateau before approving commencement of the following phase or plateau. The items to be considered in this evaluation will include, but not be limited to, the following:

a. The need for additional testing or retesting to improve assurance that a particular system or component will perform as required in subsequent testing, especially under more demanding conditions such as higher power levels;

b. The need for analysis of certain data to qualify measured variables or parameters for use in subsequent measurements;

c. The completeness of testing up to the point in question as evidenced by the documentation of the completed tests;

d. The need for specific reviews and approvals of particular sets of data to satisfy the above.

14.2.6 TEST RECORDS

14.2.6.1 General

The Test and Startup Program Manual contains a generic procedure regarding filing and record keeping to be applied to testing documentation. This procedure is intended to assure compliance of WPPSS project startup programs with the applicable provisions of American National Standard N45.2.9-1974

"Requirements for Collection, Storage and Maintenance of Quality Assurance Records for Nuclear Power Plants," as required by Regulatory Guide 1.88, Revision 1, December 1975.

The following sections describe the provisions of the aforementioned procedure, which will be contained in specific detail in the WNP-2 Test and Startup Instructions.

14.2.6.2 Test Record Responsibilities

The Startup Superintendent is responsible for identifying the responsibilities, controls and requirements for establishing and implementing a test and startup program filing and record keeping system, in accordance with 10CFR50 Appendix B, ANSI N45.2.9 and the WPPSS Quality Assurance Program Manual. The Startup Superintendent will ensure that adequate procedures are prepared and maintained within the Test and Startup Instructions. The Startup Superintendent will ensure that trained and qualified personnel maintain the Test and Startup Program files.

14.2.6.3 Types of Documents and Records Requiring Test Record File Retention

Documentation and records that will be maintained within test and startup program files are:

a. Test and startup program records as specified by ANSI N45.2.9.

b. All records and documents as specified by the Test and Startup Program and Instruction Manuals.

Other records, documents, correspondence, etc., may be maintained at the discretion and approval of the Startup Program Manager, provided their access requirements do not compromise the security of the mandatory files.

14.2.7 CONFORMANCE OF TEST PROGRAMS WITH REGULATORY GUIDES

14.2.7.1 Conformance with Regulatory Guide 1.68

The WNP-2 Test and Startup Program conforms to the requirements of Regulatory Guide 1.68 Rev. 0, "Preoperational and Initial Startup Test Programs for Water-Cooled Power Reactors,"

except where specifically noted otherwise. This Regulatory Guide has been reviewed by the Supply System for applicability of individual items in the guide to WNP-2 and its systems. The applicability to this plant has determined the nature and scope of testing to be performed. Actual exceptions to the testing required by this guide have been specifically addressed and are discussed in 14.2.7.2. Areas where the guide does not apply are not considered to be exceptions.

14.2.7.2 Exceptions to Regulatory Guide 1.68

The exceptions to Regulatory Guide 1.68 are listed below with an explanation of the justification for the exception.

a. Exception to Format of Test Procedures

   The format of the test procedures is different from that found in Appendix C of Regulatory Guide 1.68, but the difference is not considered an exception to the regulatory guide since the guide specifies required elements of a test procedure while merely implying a format.

b. Refer to C.2 for a delineation of specific exceptions to the requirements of Regulatory Guide 1.68.

14.2.7.3 Conformance with or Exceptions to Regulatory Guides other than 1.68

a. Regulatory Guide 1.70, "Standard Format and Content of the Safety Analysis Reports for Nuclear Power Plants" will be complied with for the section which pertains to the Test and Startup Program.

b. Regulatory Guide 1.33, "Quality Assurance Program Requirements" will be complied with in "Operational Quality Assurance Report" section 17.2 of the FSAR for the Test and Startup Program.

c. All other regulatory guides pertaining to individual tests will be complied with unless noted otherwise in 14.2.12.

d. Regulatory Guide 1.58 "Qualifications of Nuclear Power Plant Inspection Examination and Testing Personnel".

WPPSS Test and Startup personnel involved in testing meet the requirements of Regulatory Guide 1.58.

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

As a matter of Supply System policy, a continuous program of review of reactor operating experience is coordinated by the Operations Division of WPPSS. The sources of information reviewed in compliance with this policy are NRC information bulletins, operating experience reports, preoperational test summaries and startup reports from other plants, administrative and test procedures from other plants' startup programs, personal contacts with other nuclear plant licensees or applicants, and additional information supplied by WPPSS Technical and Operations Division's members. All available sources are utilized; relevance to particular WPPSS Nuclear projects is determined in the review process.

The information is reviewed by WNP-2 Startup Program personnel for applicability to the WNP-2 test and startup program, for incorporation into test procedures or for consideration in the administrative control of testing.

14.2.9 TRIAL USE OF PLANT OPERATING AND EMERGENCY PROCEDURES

To the extent practical throughout the preoperational and initial startup test program, test procedures utilize operating, emergency, and abnormal procedures where applicable in the performance of tests. The use of these procedures is intended to do the following:

(1) prove the specific procedure or illustrate changes which may be required,

(2) provide training of plant personnel in the use of these procedures, and

(3) increase the level of knowledge of plant personnel on the systems being tested.

Test procedures may use these operating, emergency, and abnormal procedures in several ways: the test procedure may reference the procedure directly; the test procedure may extract a series of steps from the procedure; the test procedure may use a combination of the first two methods.

14.2.10 INITIAL FUEL LOADING AND INITIAL CRITICALITY

14.2.10.1 Fuel Loading and Shutdown Power Level Tests

Fuel loading and initial criticality is conducted in accordance with written procedures after all prerequisite tests are satisfactorily completed and an operating license has been issued. Prior to approving fuel loading, the plant must be verified to load fuel. This verification is accomplished by the following steps, which are performed at the completion of preoperational testing.

14.2.10.1.1 Loss of Power Demonstration - Standby Core Cooling Required

This test demonstrates the capability of each Emergency Diesel Generator to start automatically and assumes all of its emergency core cooling loads in a loss of normal auxiliary power.

14.2.10.1.2 Cold Functional Testing

The cold functional testing defined here is an integrated system operation of various plant systems that can be

operated as systems prior to fuel loading. The intent is to observe any unexpected operational problems from either an equipment or a procedural source and to provide an opportunity for operator familiarizations with the system-operating procedures under operating conditions.

Some of the cold functional testing will be accomplished during the preoperational test program. For example, integrated and simultaneous operation of the following systems may take place during the flush of the total system: Condensate System, Condensate Demineralizer System, LPCI System, Core Spray System, RWCU System, Service Water System, CCW System, and others. As required, additional integrated systems performance will be demonstrated prior to fuel loading.

14.2.10.1.3 Routine Surveillance Testing

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

14.2.10.1.4 Master Startup Checklist

A detailed list of items that must be complete, including the preoperational tests, work requests, design changes and proper disposition of all exceptions noted during preoperational testing listed in Table 14.2-1 is rechecked to verify completion just prior to the final approvals for fuel loading and at each significant new step such as heat up, opening MSIV's and power operation.

14.2.10.1.5 Initial Fuel Loading

Fuel loading requires the movement of the full core complement of assemblies from the fuel pool to the core, with each assembly identified by number before being placed in the correct coordinate position. The procedure controlling this movement is arranged so that shutdown margin and subcritical

checks are made at predetermined intervals throughout the loading, thus ensuring safe loading increments. Specially sensitive in-vessel neutron monitors that are maintained at the loading face as loading progresses serve to provide indication for the shutdown margin measurements, and also to allow the recording of the core flux level as each assembly is added. A complete check is made of the fully loaded core to ascertain that all assemblies are properly installed, correctly oriented and are occupying their designated positions.

14.2.10.1.6 Zero Power Level Tests

At this point in the program, a number of tests are conducted which are best described as initial zero power level tests. Chemical and radiochemical tests are made in order to check the quality of the reactor water before fuel is loaded, and to establish base and background levels which will be required to facilitate later analysis and instrument calibrations. Plant and site radiation surveys are made at specific locations for later comparison with the values obtained at the subsequent operating power levels. Shutdown margin checks are repeated for the fully loaded core, and criticality is achieved with each of the two prescribed rod sequences in turn, the data being recorded for each rod withdrawn. Each rod drive is subjected to scram and performance testing. The initial setting of the Intermediate Range Monitors (IRMs) is at max gain.

14.2.10.2 Initial Heatup to Rated Temperature and Pressure

Heatup follows the satisfactory completion of the fuel loading and zero power level tests 14.2.10.1.5 and 14.2.10.1.6) and further checks are made of coolant chemistry together with radiation surveys at the selected plant locations. All CRDs are scram-timed at rated temperature and pressure, with selected drives timed at two intermediate reactor pressures and for different accumulator pressures. The process computer checkout continues as more process variables become available for input. The RCIC System will undergo controlled starts at low reactor pressure and at rated conditions, with testing in the quick-start mode at 150 and 1000 psig. Correlations

are obtained between reactor vessel temperatures at several locations and the values of other process variables as heatup continues. The movements of NSSS piping in the drywell mainly as a function of expansion are recorded for comparison with design data.

14.2.10.3 Power Testing From 25 Percent to 100 Percent of Rated Output

The Power Test Phase comprises the following tests, many of which are repeated several times at the different test levels; consequently, reference should be made to Table 14.2-4 for the probable order of execution for the full series. While a certain basic order of testing is maintained relative to power ascension, there is, nevertheless, considerable flexibility in the test sequence at a particular power level which may be used whenever it becomes operationally expedient. In no instance, however, is nuclear safety compromised.

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

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

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

(4) Following the first reasonable, accurate heat balance (25 percent power) the APRMs are calibrated and IRMs are reset if necessary.

(5) At each major power level (25 percent, 60 percent, and 100 percent), the LPRMs are calibrated.

(6) The APRMs are calibrated initially at each new power level and following LPRM calibration.

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

(8) Further tests of the RCIC are made with and without injection into the reactor pressure vessel (RPV).

(9) Collection of data from the system expansion tests is completed for those piping systems which had not previously reached full operating temperatures.

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

(11) Core performance evaluations are made at all test points above the ten percent power level and for selected flow transient conditions; the work involves the determination of core thermal power, maximum fuel rod surface heat flux, the Minimum Critical Power Ratio (MCPR), and other thermal parameters.

(12) Overall plant stability in relation to minor perturbations is shown by the following group of tests which are made at selected test points:

a. Core power-void mode response

b. Pressure regulator setpoint change

c. Water level setpoint change

d. Turbine valve surveillance

e. Recirculation flow setpoint change

For the first of these tests, a centrally located control rod is moved and the flux response is noted on a selected LPRM chamber. The next two tests require that the changes made should approximate as closely as possible a step change in demand, while for the next test the turbine stop, control and bypass valves are opened to verify stability and power

level for surveillance testing. The remaining test is performed to properly adjust the control loop of the recirculation system. For all of these tests the plant performance is monitored by recording the transient behavior of numerous process variables, the one of principal interest being neutron flux. Other imposed transients are produced by step changes in demand core flow, partial loss of a feedwater heating and simulating failure of the operating pressure regulator to permit takeover by the backup regulator. Table 14.2-3 indicates the power and flow levels at which all these stability tests are performed.

(13) The category of major plant transients includes full closure of all the main steam isolation valves, fast closure of turbine-generator control valves, fast closure of turbine-generator stop valves, loss of the main generator and offsite power, tripping a feedwater pump and several trips of the recirculation pumps. The plant transient behavior is recorded for each test and the results may be compared with the acceptance criteria and the predicted design performance. Table 14.2-2 shows the operating test conditions for all the proposed major transients.

(14) A test is made of the relief valves in which leaktightness and general operability are demonstrated.

(15) At all major power levels the jet pump flow instrumentation is calibrated.

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

(17) The local control loop performance, based on the drive pump, jet pumps and control equipment is checked.

14.2.11 TEST PROGRAM SCHEDULE

The test program schedule for preoperational and startup tests are indicated on Table 14.2-4 and Figure 14.2-4. These schedules are preliminary and will be adjusted to consider actual construction and testing progress; they are included to provide general information but are not considered to be identical to the schedules in use during the startup program. The test procedures will be made available for review at least 60 days prior to the test date or fuel load.

14.2.12 INDIVIDUAL TEST DESCRIPTIONS

14.2.12.1 Preoperational Test Procedures

The following general descriptions are the specific objectives of each preoperational test. During the final construction phase, it may be necessary to modify the preoperational test methods as operating and preoperational test procedures are developed. Consequently, methods described in the following descriptions are general, not specific.

Specific acceptance criteria for each preoperational test are in accordance with the detailed system and equipment specifications for equipment in those systems. The tests demonstrate that the installed equipment and systems perform within the limits of these specifications.

In addition to the prerequisites listed on each of the following preoperational tests there will be electrical power available to each of the systems.

Table 14.2-1 lists the preoperational test anticipated for this facility.

14.2.12.1.1 Reactor Feedwater System Preoperational Test

a. <u>Purpose</u>

To verify the operation of the Reactor Feedwater (RFW) System, including pumps, valves, turbines, turbine auxiliaries, turbine control systems.

b. <u>Prerequisites</u>

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The condensate system, control air system and service water system must have a readiness verification.

c. <u>General Test Methods and Acceptance Criteria</u>

The performance of the Reactor Feedwater (RFW) System is verified within the limitations of the auxiliary steam supply by the demonstration of the proper operation of the following:

(1) Valves and related controls, interlocks and position indicators

2. Reactor feedwater pumps, turbines and auxiliaries

3. Control logic

4. Annunciators and protective devices

14.2.12.1.2 Condensate System Preoperational Test

a. Purpose

To verify the operation of the Condensate System, including pumps, valves and control systems.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The condenser, condensate filter demineralizers, feedwater, and control air systems are capable of supporting this test as necessary.

c. General Test Methods and Acceptance Criteria

The performance of the Condensate System is verified by the demonstration of the proper operation of the following:

(1) Valves and related controls, interlocks and position indicators.

(2) Condensate pumps, condensate booster pumps and auxiliaries.

(3) Control logic.

(4) Annunciators and protective devices.

14.2.12.1.3 Fire Protection System Preoperational Test

a. Purpose

To verify the operation of the Fire Protection System, including the diesel engine, pumps, valves, detection and alarm circuits and control and instrumentation circuits. To verify the location and status of all portable equipment.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The circulating water system, control and service air system, and electrical distribution system are available to support operation.

c. General Test Methods and Acceptance Criteria

Verification of the Fire Protection System capability is demonstrated by the proper integrated operation of the following:

(1) Diesel engine and pump operation and related control and logic.

(2) Fire alarm and detection circuits.

(3) Fire control panel in the Main Control Room.

(4) Deluge, wet pipe and pre-action sprinkler systems.

(5) Carbon dioxide and Halon systems.

In addition, portable equipment and hose station capability will be verified.

14.2.12.1.4 Reactor Water Cleanup System Preoperational Test

a. Purpose

To verify the operation of the Reactor Water Cleanup (RWCU) System, including pumps, valves, and filter/demineralizer equipment.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Filter aid, and anion and cation resin should be available. Closed Cooling Water (CCW) System and instrument air system must have readiness verification.

c. General Test Methods and Acceptance Criteria

Verification of the RWCU System capability is demonstrated by the proper integrated operation of the following:

(1) Drain flow regulator flow interlocks

(2) System isolation and logic

(3) Valve-operating sequence

(4) Pump operation and related control and logic

(5) Annunciators

(6) Filter/Demineralizer System Operation

14.2.12.1.5 Standby Liquid Control System Preoperational Test

a. Purpose

To verify the operation of the Standby Liquid Control (SLC) System including pumps, tanks, control, logic, and instrumentation.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Valves should be previously bench tested and other precautions relative to positive displacement pumps taken. The reactor vessel should be available for injecting demineralized water.

c. General Test Methods and Acceptance Criteria

Verification of the SLC System capability is demonstrated by the proper integrated operations of the following:

(1) SLC System tank level instrumentation

(2) Heaters

(3) Alarms and logic

(4) Relief valves

(5) Pumps and related controls and logic

(6) Flow testing with different flow paths

14.2.12.1.6 Nuclear Boiler System Preoperational Test

a. Purpose

To verify proper operation of the Nuclear Boiler System, including safety/relief valves and related controls and logic.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Verify that all safety/relief valves have been previously bench tested.

c. General Test Methods and Acceptance Criteria

Functional and capacity tests of safety/relief valves are not performed; verification of the Nuclear Steam Supply System capability is demonstrated by the proper integrated operation of the following:

(1) System valves and related sensors and logic

(2) Vacuum breaker in relief valve discharge lines

(3) Automatic isolation function of reactor water sample isolation valves

(4) Isolation and leak detection systems

(5) Automatic depressurization system logic

(6) RV Actuators' accumulator capacity test

(7) Safety/relief valves air piston operation

(8) Reactor head seal leak detection

(9) Alarms and annunciators

14.2.12.1.7 Residual Heat Removal System Preoperational Test

a. Purpose

To verify the operation of the Residual Heat Removal (RHR) System under its various modes of operation: Low Pressure Coolant Injection (LPCI), shutdown cooling and vessel head spray, containment spray, suppression pool water cooling, and steam condensing.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The RHR service water system must have readiness verification. The reactor vessel and recirculation loops shall be intact and capable of receiving water.

c. General Test Methods and Acceptance Criteria

Verification of the RHR System capability is demonstrated by the proper integrated operation of the following:

(1) System isolation valve control and logic tests

(2) RHR and RHR service water pump and motor operation, controls and related logic features

(3) Automatic LPCI initiation logic

(4) Verification of all flow paths. The time from initiation signal to full flow should be similarly verified.

(5) Alarms and annunciators

14.2.12.1.8 Reactor Core Isolation Cooling System Preoperational Test

a. Purpose

To verify the operation of the Reactor Core Isolation Cooling (RCIC) System including turbine, pump, valves, instrumentation and control.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The turbine, disconnected from the pump shall be tested. The turbine instruction manual shall be reviewed in detail in order that precautions relative to turbine operation are followed. Then the system shall be tested within the capability of a temporary steam supply with the pump coupled to the turbine.

c. General Test Methods and Acceptance Criteria

Verification of system capability is demonstrated by the proper integrated operation of the following:

(1) All valves and related controls, interlocks, and indicators

(2) Manual and automatic initiation

(3) Automatic isolation, including leak detection system logic

(4) Turbine speed control, trip, mode selection, and test mode

(5) Barometric condenser condensate pump, and vacuum pump controls

(6) Flow path verification

(7) Annunciators

14.2.12.1.9 Reactor Recirculation System and Control Preoperational Test

a. Purpose

To verify the operation of the Reactor Recirculation System, including pumps, and their associated motors, valves, instrumentation, and controls. The rated conditions tests will be conducted during the startup testing program.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The CCW System must receive readiness verification. All required testing of equipment up to the operation of the recirculation pump has been completed, including recirculation pump motor (uncoupled) and all control loops.

c. General Test Methods and Acceptance Criteria

After prerequisite testing, verification of system capability is demonstrated by the proper integrated operation of the following.

(1) System valves

(2) Logic and interlocks

(3) Recirculation pumps, valves, and related controls and interlocks

(4) Annunciators

(5) LFMG set

14.2.12.1.10 Reactor Manual Control System Preoperation Test

a. Purpose

To verify the operation of the Reactor Manual Control System (RMCS), including relays, control circuitry, switches and indicating lights, and control valves.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Control rod drive (CRD) pump will not be operational during this test.

c. General Test Methods and Acceptance Criteria

Verification of RMCS capability is demonstrated by the proper integrated operation of the following:

(1) Rod blocks, alarms, and interlocks for all modes of the reactor mode switch

(2) Rod position information system

(3) Rod drift alarm circuit

(4) Rod directional control valve time sequence for insert and withdraw commands

14.2.12.1.11 Control Rod Drive Hydraulic System Preoperational Test

a. Purpose

To verify the operation of the CRD Hydraulic System, including CRD mechanisms, hydraulic control units, hydraulic power supply, instrumentation, and controls.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The CRD Manual Control System Preoperational Test must be completed on associated CRD's. The CCW System and instrument air system must receive readiness verification.

c. General Test Methods and Acceptance Criteria

Verification of CRD System capability is demonstrated by the proper integrated operation of the following:

(1) Logic and interlocks

(2) CRD pumps and related controls and interlocks

(3) Flow controller, pressure control valves, and stabilizer valves

(4) Scram discharge level switches, and CRD position indication, alarms, and interlocks

(5) CRDs functional testing including latching and position indication

(6) Scram testing of control rods at atmospheric pressure

(7) Annunciators

14.2.12.1.12 Fuel Handling and Vessel Servicing Equipment Preoperational Test

a. Purpose

To verify the operation of the fuel handling and vessel servicing equipment, including tools used in the servicing of control rods, fuel assemblies, local power range monitors (LPRM's) and dry tubes, and vacuum cleaning equipment.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, the refueling platform, fuel preparation machine, and fuel racks must be installed and operational; all slings and lifting devices must be certified at their design load, at least by the vendor.

c. General Test Methods and Acceptance Criteria

Verification of the fuel handling and vessel servicing equipment is demonstrated by dry operation of the following equipment:

(1) Cell disassembly tools

(2) Channel replacement tools

(3) Instrument handling tools

(4) Vacuum cleaning equipment

(5) Interlocks and logic associated with the refueling and service platform are verified

(6) Proper operation of refueling and service platforms are verified

14.2.12.1.13 Low Pressure Core Spray System Preoperational Test

a. Purpose

To verify the operation of the low pressure core spray system, including spray pumps, sparger ring, spray nozzles, controls, valves, and instrumentation.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The reactor vessel must be available and ready to receive water.

c. General Test Methods and Acceptance Criteria

Verification of low pressure core spray system capability is demonstrated by the proper integrated operation of the following:

(1) Logic and interlocks

(2) Low Pressure Core Spray system pumps, including auto initiation

(3) Flow path verification, including determination of system hydraulic performance to verify proper sizing of restricting orifice in LPCS discharge line to vessel, see 6.3.2.2.3.

(4) Annunciators

(5) The time for initiation signal to full flow should be verified

(6) Photographs to prove acceptability of core spray patterns

14.2.12.1.14 High Pressure Core Spray System Preoperational Test

a. Purpose

To verify the operation of the High Pressure Core Spray (HPCS) System, including diesel generator and related auxiliary equipment, pumps, valves, instrumentation and control.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The HPCS diesel generator must be installed and be operational.

c. General Test Methods and Acceptance Criteria

Verification of HPCS System capability is demonstrated by the proper integrated operation of the following:

(1) Valve controls and interlocks

(2) HPCS electrical system tests, including DC and AC

(3) HPCS diesel generator functional tests, including starting, rated load, load rejection

(4) Pump and motor tests with normal power supply and with diesel generator

(5) HPCS flow path and flow rate verification

(6) Annunciators

(7) The time from initiation signal to full flow should be verified

(8) Photographs to prove acceptability of HPCS spray pattern

14.2.12.1.15 Fuel Pool Cooling and Cleanup System Preoperational Test

a. <u>Purpose</u>

To verify the operation of the fuel pool cooling and cleanup system including the pumps, heat exchangers, controls, valves and instrumentation.

b. <u>Prerequisites</u>

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The instrument air, service air, fuel pool emergency makeup, service water, and RHR systems must be available.

c. <u>General Test Methods and Acceptance Criteria</u>

Verification of the fuel pool system capability is demonstrated by the integrated operation of the following:

(1) Logic and interlocks

(2) Interconnection to RHR system

(3) Pump operation and related controls

(4) Cleanup subsystem operation

(5) Annunciators

14.2.12.1.16 Leak Detection System Preoperational Test

a. Purpose

To summarize the test requirements and verify the leak detection test data for each of the nuclear systems.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The prerequisites are included in the preoperational test specifications for each of the nuclear systems listed below.

c. General Test Methods and Acceptance Criteria

As an integral part of each of the following system preparational tests, the nuclear systems leak detection is verified by the proper operation of the leak detection features of the following nuclear systems:

(1) Feedwater Control System

(2) RWCU System

(3) NSSS

(4) RHR System

(5) RCIC System

(6) Recirculation System

(7) Radwaste System

14.2.12.1.17 Liquid and Solid Radwaste System Preoperational Test

a. Purpose

To verify that the radioactive waste system will perform its design functions of processing liquid and solid radioactive wastes.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing.

c. General Test Methods and Acceptance Criteria

Testing will demonstrate that the pumps, tanks, controls and valves including automatic isolation, diversion and protective features and instrumentation and alarms will operate and function in accordance with design requirements.

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14.2.12.1.18 Reactor Protection System Preoperational Test

a. Purpose

To verify the proper operation of the Reactor Protection System (RPS), including sensor logic and their respective scram relays, scram reset time delay, the annunciators, and motor-generator set power supply.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing.

c. General Test Methods and Acceptance Criteria

Verification of the RPS capability is demonstrated by the proper integrated operation of the following:

(1) Motor-generator set performance

(2) Sensor logic and scram relay logic

(3) Scram reset time delay

(4) Sensors input-to-scram trip actuator response time on all channels of each function for which response times are required by Technical Specifications.

(5) Annunciators

(6) Mode switch tests

(7) Auxiliary sensor operation

The ability of the system to scram the reactor within a specified time must be demonstrated in the CRD Hydraulic System Preoperational Test (14.2.12.1.11).

14.2.12.1.19 Neutron Monitoring System Preoperational Test

a. Purpose

To verify the operation of the Neutron Monitoring System (NMS), including startup, intermediate, and power range detectors, and their related equipment.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, all source range monitors (SRM's) and pulse preamplifiers, intermediate range monitors (IRM's) and voltage preamplifiers, and average power range monitors (APRM's) will have been calibrated per vendor's instructions.

c. General Test Methods and Acceptance Criteria

Verification of the NMS capability is demonstrated by the proper integrated operation of the following:

(1) All SRM detectors, and their respective insert and retract mechanisms, and cables

(2) SRM channel, including pulse preamp, remote meter and recorder, trip logic, logic bypass and related lamps and annunciators, control system interlocks, refueling instrument trips, and power supply

(3) All IRM detectors and their respective insert and retract mechanisms and cables

(4) IRM channels, including voltage preamps, remote recorders, RMCS interlocks, RPS trips, annunciators and lamps, and power supplies

(5) All LPRM detectors and their respective cables, and power supplies

(6) All APRM channels, including trips, trip bypasses, annunciators and lamps, remote recorders, RMCS interlocks, RPS trips, and power supplies

(7) Recirculation flow bias signal, including flow unit, flow transmitters, and related annunciators, interlocks, and power supplies

(8) Both RBM channels, including trips, trip bypasses, annunciators and lamps, remote recorders, RMCS interlocks and power supplies.

14.2.12.1.20 Traversing In-Core Probe System Preoperational Test

a. Purpose

To verify the operation of the Traversing In-Core Probe (TIP) System, including the TIP detector, controls and interlocks, containment secure lamp and containment isolation circuits.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, the TIP detector and dummy detector, ball valve time delay, core top and bottom limits, clutch, X-Y Recorder, and purge system will have been shown to be operational.

c. General Test Methods and Acceptance Criteria

With the exception of the shear valve, which is not tested, verification of the TIP System is demonstrated by the proper integrated operation of the following:

(1) Indexer cross-calibration interlock

(2) Shear valve control monitor lamp

(3) Drive motor manual control and override, automatic control and stop, and low speed control

14.2.12.1.21 Rod Worth Minimizer System Preoperational Test

a. Purpose

To verify the operation of the Rod Worth Minimizer (RWM) System under its various modes of operation.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, the Rod Position Indication System (RPIS) will have been shown to be operational, Rod Sequence Control (RSC) System bypassed, and computer diagnostic and special tests complete.

c. General Test Methods and Acceptance Criteria

Verification of the RWM System is demonstrated by the proper computer initiation of the following:

(1) Rod test option

(2) System initialization both above and below the low power setpoints, and above and below the low power alarm points

(3) RWM program

(4) Rod withdrawal and insertion error block

(5) Rod drift scan, and annunciation

RWM program acceptance of an operator-supplied rod position value must be demonstrated.

14.2.12.1.22 Process Radiation Monitoring System Preoperational Test

a. Purpose

To verify the operation of the Process Radiation Monitoring (PRM) System, including the offgas vent, offgas, main steam line, liquid process, and building ventilation radiation monitoring subsystems.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, the process radiation monitors and pulse preamplifiers, power supplies, indicator and trip units, and sensors and converters are calibrated according to the vendor's instruction manual; insulation resistance and high potentiometer tests will have been completed.

c. General Test Methods and Acceptance Criteria

Verification of the PRM System is demonstrated by the proper integrated operation of the following:

(1) Vent sensors, preamps, channels, trip points, annunciators and lamps, sample rack, and check source

(2) Offgas vial sampler, Log Radiation Monitor (LRM) and their related annunciators, lamps and recorders, and high/low flow detector

(3) Main steam gamma detector and LRM channels, trip points, and annunciators and lamps, High-High and Inop Trip, and recorders

(4) Liquid process scintillation detector, preamps, channels, trip points, and annunciators and lamps, and recorders

(5) Building ventilation system sensors, channels, trip points, and annunciators and lamps, recorders, and standby gas treatment interlock

(6) Control center air monitoring sensors, channels, annunicators, and indicators

14.2.12.1.23 Area Radiation Monitoring System Preoperational Test

a. Purpose

To verify the operation of the Area Radiation Monitoring (ARM) System, including sensors and channels, trip points, alarms, and recorder.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiaton of testing. Additionally, indicator and trip units, power supplies, and sensor/converters are calibrated according to the vendor's instruction manual.

c. General Test Methods and Acceptance Criteria

Verification of the ARM System capability is demonstrated by the proper integrated operation of the following:

(1) Sensor/converter, and associated channels

(2) Channel trip points

(3) Alarm annunciators and lights

(4) Recorder

14.2.12.1.24 Process Computer Interface System Preoperational Test

a. Purpose

To verify the operation of the Process Computer Interface (PCI) System, including computer inputs and printout.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, computer diagnostic checks and programming are completed.

c. General Test Methods and Acceptance Criteria

Verification of the PCI System is demonstrated by proper operation of the following:

(1) Analog input signals

(2) Computer printout

(3) Digital input signals

(4) Digital output signals

14.2.12.1.25 Rod Sequence Control System (RSCS) Preoperational Test

a. Purpose

To verify the operation of the Rod Sequence Control System (RSCS) under its various modes of operation.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, the self-test feature of the RSCS is verified.

c. General Test Methods and Acceptance Criteria

Verification of the RSCS is demonstrated by the proper initiation of the following:

(1) Low power setpoint and low power alarm point tests

(2) RSCS status displays and annunciators

(3) Reactor mode switch test

(4) System diagnostic and data quality tests

(5) Rod position data tests

(6) Single rod bypass provision

(7) Rod sequences tests

(8) Rod group assignment

(9) Constraints of rod movement tests

(10) 100% to 75% control rod density tests

(11) 75% to 50% control rod density tests

(12) 50% control rod density to low power setpoint tests

14.2.12.1.26 Remote Shutdown Preoperational Test

a. Purpose

To verify the feasibility and operability of the shutdown functions from the remote shutdown panel and its ability to bring the reactor to a cold condition in an orderly fashion.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Additionally, the control power should be supplied to the remote shutdown panel, and the independence of power supply voltage, and fuses should be verified.

c. General Test Methods and Acceptance Criteria

Verification of the remote shutdown system is demonstrated by the following tests:

(1) Operation of valves, controls, instruments, and pumps on systems available from this panel.

(2) Transfer switch operation from the control room panels to the remote shutdown panel.

14.2.12.1.27 Offgas System Preoperational Test

a. Purpose

To verify the operation of the offgas system including valves, recombiner, condensers, coolers, filters, and hydrogen analyzers.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent (Assistant Plant Manager) has approved the initiation of testing. Additionally, the instrument air system, electrical power, and cooling water should be operational.

c. General Test Methods and Acceptance Criteria

Verification of the offgas system is demonstrated by the following tests:

(1) Valve operation including fail safe and isolation features and valve status lights indicate the correct valve position;

(2) Pump operation;

(3) Level and temperature control and indication;

(4) Recombiner and preheater tests;

(5) Condenser, cooler and moisture separator tests;

(6) Gas dryer and cooler tests;

(7) Filter efficiency;

(8) Hydrogen analyzer performance test;

(9) Purge and bleed air rate test; and

(10) Charcoal absorber vault refrigeration test.

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14.2.12.1.28 Environs Radiation Monitoring Preoperational Test

a. Purpose

To verify the operation of the environs radiation monitoring system, including dosimeters, sampling pump, and filter equipment.

b. Prerequisites

System Lineup Tests have been word completed, the TWG has reviewed and approved the procedure, and the Startup Superintendent has approved the initiation of testing. Additionally, indicator power supplies are calibrated according to the vendor's instruction manual.

c. General Test Method and Acceptance Criteria

Verification of the environs radiation monitoring system capability is demonstrated by the proper operation of the following:

(1) Air Sample Equipment

(2) TLD (Passive Dosimeters)

14.2.12.1.29 Main Steam System Preoperational Test

a. Purpose

To verify the proper operation of the Main Steam Isolation Valves (MSIVs) and related controls.

b. Prerequisites

The System Lineup Tests have been completed, the TWG has reviewed and approved the procedure, and the Startup Superintendent has approved the initiation of testing.

c. General Test Methods and Acceptance Criteria

Verification of the Main Steam System is demonstrated by the following:

(1) Automatic isolation of the MSIV's.

(2) Minimum closing times are met.

(3) MSIV accumulator capacity tests are satisfactory.

(4) Valves, heaters, blowers and initiating logic of the Main Steam Isolation Valve Leakage Control System.

14.2.12.1.30 Radwaste Building HVAC System Preoperational Test

a. Purpose

To verify that the Radwaste Building HVAC System will function in accordance with the design requirements as set forth in the design specifications.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The 480 VAC Power System, Control Air Supply Service Air System and the Turbine Service Water System is capable of supporting this test as necessary.

c. General Test Methods and Acceptance Criteria

Verification of the Radwaste Building HVAC System is demonstrated by the proper operation of the following:

(1) Ventilation fans and their related controls

(2) Filters and instrumentation

(3) Dampers and controls

(4) Annunciators and protective devices

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14.2.12.1.31 Closed Cooling Water System Preoperational Test

a. Purpose

To verify the operation of the Closed Cooling Water (RCC) System, including pumps, valves, logic and annunciator.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The following support systems must have received readiness verification:

(1) Control and Service Air (CAS/SA)

(2) Makeup Water Treatment

(3) Essential 480 Vac Power

(4) Instrumentation Power

c. General Test Methods and Acceptance Criteria

Verification of the Closed Cooling Water System is demonstrated by the proper operation of the following:

(1) Surge tank level control

(2) System pumps and control logic

(3) Chemical addition pump and control

(4) Remote-operated valves

14.2.12.1.32 Primary Containment Atmospheric Control System Preoperational Test

a. Purpose

To verify the operation of the Primary Containment Atmospheric Control (CAC) System including blowers, coolers, valves, instruments and alarms.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Primary Containment, Essential 480 Vac Power, Standby Service Water, Instrument Power and Control Air Systems must have received readiness verification.

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c. General Test Methods and Acceptance Criteria

Verification of the Primary Containment Atmospheric Control System is demonstrated by the proper integrated operations of the following:

(1) Isolation and control valves

(2) Blowers

(3) Instrumentation

(4) Alarms

(5) Recombiner components to the extent that flow paths are verified

Primary Containment Atmospheric Control System hydrogen/oxygen recombining performance capabilities are not demonstrated during the preoperational test.

14.2.12.1.33 Primary Containment Cooling System Preoperational Test

a. Purpose

To verify the operation of the Primary Containment Cooling (CRA) System including fans, dampers, related controls and instrumentation.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. 480 Vac Power, Instrument Power, and Closed Cooling Water Systems must have received readiness verification.

c. General Test Methods and Acceptance Criteria

Verification of the Primary Containment Cooling System is demonstrated by the proper operation of the following:

(1) Fans and control logic

(2) Cooling coils

(3) Dampers, cooling water flow control valves and related controls

(4) Instrumentation

(5) Related loss-of-power logic

(6) Annunciators

Primary Containment Cooling System heat removal capabilities are not demonstrated during the preoperational test.

14.2.12.1.34 Primary Containment Instrument Air Preoperational Test

a. Purpose

To verify proper operation of the Containment Instrument Air System, including compressors, dryers, valves and related controls and logic.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The Plant Service Water Supply System must receive a readiness classification.

c. General Test Methods and Acceptance Criteria

Verification of the CIA System capability is demonstrated by the proper integrated operation of the following:

(1) Logic and interlocks

(2) CIA System air compressors

(3) CIA System air dryers

(4) System non return check valves

(5) Alarms and controls

(6) Nitrogen backup supply

(7) Valve/component failure modes for those valves/components supplied by the CIA system to simulated loss of air supply

14.2.12.1.35 Primary Containment Atmospheric Monitoring System Preoperational Test

a. Purpose

To verify the capability of the Primary Containment Atmospheric Monitoring (CMS) System to monitor and display containment atmospheric conditions.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Instrument power is available to system components.

c. General Test Methods and Acceptance Criteria

Verification of the Primary Containment Atmospheric Monitoring System capability is demonstrated by the proper operation of the following:

(1) Samples and controls

(2) Analyzers

(3) Pressure and temperature instrumentation

(4) Radiation monitors

(5) Indicating/recording instrumentation

(6) Annunciators

14.2.12.1.36 Standby Gas Treatment System Preoperational Test

a. Purpose

To verify the reliable operation of the Standby Gas Treatment (SGT) System, including fans, filter trains and related controls.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The following systems must have readiness verification:

(1) Essential 480 Vac power

(2) Instrument power

(3) Control air

(4) Reactor Building Heating and Ventilation

c. General Test Methods and Acceptance Criteria

Verification of the Standby Gas Treatment System is demonstrated by the proper integrated operation of the following:

(1) SGT fans and control logic

(2) Filter trains and related instruments

(3) Automatic valves and control logic

(4) System interconnections to Reactor Building Heating and Ventilation, and Primary Containment Atmospheric Control Systems

(5) Annunciators

14.2.12.1.37 Loss of Power and Safety Testing Preoperational Test

a. Purpose

To verify the operaton of the 230/115kV, 6.9kV, 4.16kV, and 480V distribution systems.

To verify the integrated ability of the plant electrical distribution and safety systems to operate on normal and standby power sources during accident conditions.

To verify that loss of a single AC or DC distribution system division (exclusive of the HPCS diesel generator and batteries) will not prevent the remaining systems from actuating during an accident condition.

b. Prerequisites

The System Lineup Tests and the 69/N consecutive starts for the emergency D/Gs have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The 125V DC system and the ECCS are available to support testing.

c. General Test Methods and Acceptance Criteria

Verification of the 230/115kV, 6.9kV, 4.16kV and 480V distribution system operability shall be demonstrated by the following:

(1) Demonstration of circuit integrity and integrated operation of circuit breakers, controls and interlocks, instrumentation, automatic transfer features and protective devices and alarms.

(2) Demonstration of proper system response to a loss of the 230kV and 115kV distribution systems independently and simultaneously both with and without LOCA/containment isolation signals.

(3) Demonstration of proper system response to a loss of the 230/115kV distribution systems and one individual standby diesel generator during an ECCS/containment isolation actuation.

Signals for these tests shall be simulated from the actual initiating devices when this is practical.

(4) Testing of the Diesel Generators will include the following:

a. Sequential loading of each diesel generator unit.

b. Maintenance of specified frequency and voltage during the loading sequence.

c. The diesel generator's capability to reject and restart their largest single load anytime after the design loading sequence is complete.

d. The dieselgenerator's capability to supply power to vital equipment during loss of station normal power conditions.

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14.2.12.1.41 Instrument Power Preoperational Test

a. Purpose

To verify the operation of the Instrument Power (IP) Systems.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing.

The 125Vdc and the 480Vac power systems are energized and capable of supplying power to the Instrument Power Systems.

c. General Test Methods and Acceptance Criteria

Verification of the Instrumentation Power Systems shall be accomplished by demonstrating circuit integrity and integrated operation of:

(1) Static inverters, transformers and buses

(2) Controls and interlocks

(3) Transfer features

(4) Instrumentation

(5) Protective devices and alarms

14.2.12.1.42 Emergency Lighting System Preoperational Test

a. <u>Purpose</u>

To verify the operation of the Emergency Lighting system (EL) within the design requirements of the System.

b. <u>Prerequisites</u>

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The 125 Vdc system has received a readiness verification.

c. <u>General Test Methods and Acceptance Criteria</u>

Verification of the Emergency Lighting system is to demonstrate proper automatic operation of the system and to provide sufficient lighting during loss of normal lighting.

14.2.12.1.43 Standby AC Power System Preoperational Test

a. <u>Purpose</u>

To verify the operation of the Standby AC Power System including diesel engines, auxiliaries, generators, controls and instrumentation.

b. <u>Prerequisites</u>

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing.

The following support systems or components must have received readiness verification:

(1) Standby Service Water

(2) 125/250 Vdc Power

(3) Instrument Power

(4) Essential 4160 Vac Power

c. <u>General Test Methods and Acceptance Criteria</u>

Verification of the Standby AC Power System is demonstrated by the proper integrated operation of the following:

(1) The diesel engines and auxiliaries

(2) The generators, exciters and voltage regulators

(3) Fuel storage and supply system

(4) Start and control logic circuitry and interlocks

(5) Protective devices

(6) Instrumentation

(7) Annunciators

Testing will be performed to demonstrate the following design features:

(1) The diesel-generators' performance capability to establish frequency, voltage and load acceptance with a specified time interval upon initiation of an automatic start signal under both cold and hot conditions.

(2) Specified full- and over-load performance capabilities.

(3) The diesel generator's capability to reject the maximum rated load without exceeding speeds or voltage which will cause tripping.

14.2.12.1.44 250 Vdc Power System Preoperational Test

a. Purpose

To verify the operation of the 250 Vdc Power System including batteries, chargers, controls, interlocks, instruments and protective devices.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Battery room ventilation and 480 Vac power supply to the chargers have received readiness verification.

c. General Test Methods and Acceptance Criteria

Verification of the 250 Vdc Power System is demonstrated by the proper integrated operation of the following:

1. Battery chargers including capability to recharge the battery in accordance with 8.3.2.1.4.3.

(2) Batteries (including charge and discharge rate/capacity tests and load profiles described in Table 8.3-5)

(3) Protective relays and devices

(4) System control logic

(5) Instrumentation (including ground detection)

(6) Breakers

(7) Annunciators

14.2.12.1.45 125 Vdc Power System Preoperational Test

a. Purpose

To verify the operation of the 125 Vdc Power System including batteries, chargers, controls, interlocks, instruments and protective devices.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Battery room ventilation and 480 Vac power supply to the chargers have received readiness verification.

c. General Test Methods and Acceptance Criteria

Verification of the 125 Vdc Power System is demonstrated by the proper integrated operation of the following:

(1) Battery chargers including capability to recharge the battery in accordance with 8.3.2.1.1.3

(2) Batteries (including charge and discharge rate/capacity tests and load profiles described in Table 8.3-4a and b)

(3) Protective relays and devices

(4) System control logic

(5) Instrumentation (including ground detection)

(6) Breakers

(7) Annunciators

14.2.12.1.46 24 Vdc Power System Preoperational Test

a. Purpose

To verify the operation of the 24 Vdc Power System.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Sperintendent has approved the initiation of testing.

Battery room ventilation is operating and 120/240 Vac power is available and capable of supplying the battery chargers.

c. General Test Methods and Acceptance Criteria

Verification of the 24 Vdc Power System shall include demonstrations of battery capacity and battery charger capabilities described in 8.3.2.1.3.3

14.2.12.1.47 Plant Service Water System Preoperational Test

a. Purpose

To demonstrate the proper operation of the Plant Service Water (TSW) System, including pumps, valves and related controls.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing.

The following support systems or components must have received readiness verification:

(1) 4160 Vac Power

(2) 480 Vac Power

(3) Instrument Power

(4) Service water pump house structure

(5) Various heat exchangers or coolers utilizing service water

(6) Tower Makeup (TMU)

c. General Test Methods and Acceptance Criteria

Verification of the Plant Service Water System is demonstrated by the proper operation and performance of the service water pumps, the operation of filters, remote-operated valves, related controls and instrumentation.

14.2.12.1.48 Standby Service Water System Preoperational Test

a. Purpose

To verify the proper operation of the Standby Service Water (SWS) System for normal and abnormal plant operating modes.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The following support systems or components must have received readiness verification:

(1) Essential 4160 Vac power

(2) Instrument power

(3) Control Air

(4) Standby service water pump house structure

(5) Various heat exchangers or coolers utilizing standby service water

(6) Tower Makeup (TMU)

c. <u>General Test Methods and Acceptance Criteria</u>

Standby Service Water System heat dissipation capabilities are not demonstrated during the preoperational test. Verification of this system is demonstrated by the proper integrated operation and performance of the following:

(1) Pumps and related controls

(2) Remote-operated valves and controls

(3) Automatic-operated valves and control logic

(4) Instrumentation

(5) Annunciators

(6) Standby Service Water System control logic response to a simulated loss of normal station power event.

14.2.12.1.49 Plant Communications System Preoperational Test

a. <u>Purpose</u>

To demonstrate that the Plant Communications and Evacuation Alarm System will provide effective communication between various plant locations and to verify proper operation of the emergency evacuation alarm components and system.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing.

c. General Test Method and Acceptance Criteria

Proper operation of all the communication system components and the emergency evacuation alarm system and components will be demonstrated.

14.2.12.1.50 Reactor Building Emergency Cooling System Preoperational Test

a. Purpose

To demonstrate the proper integrated operation of the Reactor Building Emergency Equipment Cooling System including fans, cooling coils, instrumentation and controls.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The following support systems or components must have received readiness verification:

(1) Electrical power to motors, control circuits and instrumentation

(2) Standby Service Water System

c. General Test Method and Acceptance Criteria

Verification of this system is demonstrated by the proper integrated operation of the fan coil units, their associated controls, interlocks and annunciations.

14.2.12.1.51 Control, Cable and Critical Switchgear Rooms Heating, Ventilation and Air Conditioning System Preoperational Test

a. <u>Purpose</u>

To verify that the Control, Cable and Critical Switchgear Rooms Heating, Ventilation and Air Conditioning (CR-HVAC) Systems will function in accordance with the design requirements as set forth in the design specifications.

b. <u>Prerequisites</u>

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The following support systems have received readiness verification:

(1) 480 Vac Power

(2) Instrument Power

(3) Chilled water

c. <u>General Test Methods and Acceptance Criteria</u>

Verification of the Control, Cable and Critical Switchgear Rooms Heating, Ventilation and Air Conditioning System is demonstrated by the proper integrated operation of the following:

(1) Supply and exhaust fans and their related controls

(2) Filters, campers, valves and related instrumentation and control logic

(3) Coolers

(4) Annunciators

14.2.12.1.52 Standby Service Water Pumphouse H & V System Preoperational Test

a. Purpose

To verify that the Standby Service Water Pump House H & V System will function in accordance with the design requirements as set forth in the design specifications.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The 480 Vac Power System must have received readiness verification.

c. General Test Methods and Acceptance Criteria

Verification of the Standby Service Water Pump-house H & V System is demonstrated by the proper operation of the following:

1. Ventilation fans and their related controls
2. Tilters and instrumentation
3. Dampers and controls
4. Annunciators

14.2.12.1.53 Reactor Building Crane Preoperational Test

a. Purpose

To verify the operation of the Reactor Building Crane.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. Construction load tests of 125% static and 100% operational are complete.

Contractor use of the Reactor Building Crane for construction purposes is complete.

c. General Test Methods and Acceptance Criteria

Verification of the Reactor Building Crane is demonstrated by the proper operation of the following:

(1) Crane Traverse components

(2) Hook traverse and hoist components

(3) Controls and indicators

(4) Safety devices

(5) Instrumentation

14.2.12.1.54 Primary Containment Integrated Leak Rate Preoperational Test

a. Purpose

To verify overall primary containment integrity by pressurizing to specified test pressures and conducting integrated leak rate measurements.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The following supporting activities, systems or components must have been completed or received readiness verification:

(1) All type B and C local leak testing completed, documented and verified as a System Lineup Test, refer to FSAR 6.2.6.2 and 6.2.6.3

(2) All containment isolation valves fully operable and closed in the normal manner using the isolation signal

(3) All containment-associated piping hangers, supports, restraints and anchors have been installed and properly set

(4) Residual Heat Removal and Core Spray Systems preoperational tests complete

(5) A containment area survey completed to locate, isolate or remove any instrumentation, light bulbs, etc., which may be damaged by high external pressure

c. <u>General Test Methods and Acceptance Criteria</u>

Verification of primary containment integrity is demonstrated by pressurizing to the required test pressure. See FSAR 6.2.6.1 for a detailed test description.

The drywell-wetwell leakage test will be performed as part of this test to verify the acceptance criteria described in FSAR 3.8.3.7.

14.2.12.1.55 Secondary Containment Integrated Leak Rate Preoperational Test

a. <u>Purpose</u>

To verify overall secondary containment integrity by subjecting the Reactor Building to a specified negative pressure and measuring the inleakage.

b. <u>Prerequisites</u>

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The following supporting activities or systems/components must have been completed or received readiness verification:

(1) Reactor Building structure complete with personnel and railroad air lock doors installed and operable

(2) Reactor Building conduit, pipe and other structural penetrations sealed

(3) Standby Gas Treatment System

c. General Test Methods and Acceptance Criteria

Verification of secondary containment integrity is demonstrated by operating the Standby Gas Treatment System at a specific capacity while maintaining the Reactor Building internal structure at a specified negative pressure.

14.2.12.1.56 Diesel Generator Building H & V System Preoperational Test

a. Purpose

To verify that the Diesel Generator Building H&V System will function in accordance with the design requirements as set forth in the design specifications.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing. The 480 Vac Power System must have received readiness verification.

c. General Test Methods and Acceptance Criteria

Verification of the Diesel Generator Building H & V System is demonstrated by the proper operation of the following:

(1) Ventilation fans and their related controls

(2) Tilters and instrumentation

(3) Dampers and controls

(4) Annunciators

14.2.12.1.57 Seismic Monitoring system Preoperational Test

a. Purpose

To verify the operation of the Seismic Monitoring System.

b. Prerequisites

The System Lineup Tests have been completed and the TWG has reviewed and approved the procedure and the Startup Superintendent has approved the initiation of testing.

c. General Test Methods and Acceptance Criteria

Verification of the Seismic Monitoring System is demonstrated by proper integrated operation of the following:

(1) Annunciators

(2) Instrumentation

BLANK

14.2.12.2 General Discussion of Startup Tests

All those tests comprising the Startup Test Phase (Table 14.2-4) are discussed in this section. For each test a description is provided for test purpose, test prerequisites, test description and statement of test acceptance criteria, where applicable. Additions, deletions, and changes to these discussions are expected to occur as the test program progresses. Such modification to these discussions will be reflected in amendments to the FSAR.

In describing the purpose of a test, an attempt is made to identify those operating and safety-oriented characteristics of the plant which are being explored.

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

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

For transients involving oscillatory response, the criteria are specified in terms of decay ratio (defined as the ratio of successive maximum amplitudes of the same polarity). The decay ratio must be less than unity to meet a Level 1 criterion and less than 0.25 to meet Level 2.

14.2.12.3 Startup Test Procedures

14.2.12.3.1 Test Number 1 - Chemical and Radiochemical

14.2.12.3.1.1 Purpose

The principal objectives of this test are a) to secure information on the chemistry and radiochemistry of the reactor coolant, and b) to determine that the sampling equipment, procedures and analytic techniques are adequate to supply the data required to demonstrate that the chemistry of all parts of the entire reactor system meet specifications and process requirements.

Specific objectives of the test program include evaluation of fuel performance, evaluations of demineralizer operations by direct and indirect methods, measurements of filter performance, confirmation of condenser integrity, demonstration of proper steam separator-dryer operation, measurement and calibration of the offgas system, and calibration of certain process instrumentation. Data for these purposes is secured from a variety of sources: plant operating records, regular routine coolant analysis, radiochemical measurements of specific nuclides, and special chemical tests.

14.2.12.3.1.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.1.3 Description

Prior to fuel loading a complete set of chemical and radiochemical samples will be taken to ensure that all sample stations are functioning properly and to determine initial concentrations. Subsequent to fuel loading during reactor heatup and at each major power level change, samples will be taken and measurements will be made to determine the chemical and radiochemical quality of reactor water and reactor feedwater, amount of radiolytic gas in the steam, gaseous activities leaving the air ejectors, decay times in the offgas lines and performance of filters and demineralizers.

Calibrations will be made of monitors in the stack, liquid waste system and liquid process lines.

14.2.12.3.1.4 Criteria

Level 1

Chemical factors defined in the Technical Specifications must be maintained within the limits specified.

The activity of gaseous liquid effluents must conform to license limitations.

Water quality must be known at all times and should remain within the guidelines of the Water Quality Specifications.

Level 2

Not applicable.

14.2.12.3.2 Test Number 2 - Radiation Measurements

14.2.12.3.2.1 Purpose

The purposes of this test are a) to determine the background radiation levels in the plant environs prior to operation for base data on activity buildup and b) to monitor radiation at selected power levels to assure the protection of personnel during plant operation.

14.2.12.3.2.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.2.3 Description

A survey of natural background radiation throughout the plant site will be made prior to fuel loading. Subsequent to fuel loading, during reactor heatup and at power levels of 25%, 60% and 100% of rated power, gamma radiation level measurements and where appropriate, thermal and fast neutron dose rate measurements will be made at significant locations throughout the plant. All potentially high radiation areas will be surveyed.

14.2.12.3.2.4 Criteria

<u>Level 1</u>

The radiation doses of plant origin and the occupancy times of personnel in radiation zones shall be controlled consistent with the guidelines of the Standards for Protection Against Radiation outlined in 10 CFR 20.

<u>Level 2</u>

Not applicable.

14.2.12.3.3 Test Number 3 - Fuel Loading

14.2.12.3.3.1 Purpose

The purpose of this test is to load fuel safely and efficiently to the full core size.

14.2.12.3.3.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Also the following prerequisites will be met prior to commencing fuel loading to assure that this operation is performed in a safe manner:

a. The status of all systems required for fuel loading will be specified and will be in the status required.

b. Fuel and control rod inspections will be complete. Control rods will be installed and tested.

c. At least three movable neutron detectors will be calibrated and operable. At least three neutron detectors will be connected to the high flux scram trips. They will be located so as to provide acceptable signals during fuel loading.

d. Nuclear instruments will be source checked with a neutron source prior to loading or resumption if sufficient delays are incurred.

e. The status of secondary containment will be specified and established.

f. Reactor vessel status will be specified relative to internal component placement and this placement established to make the vessel ready to receive fuel.

g. Reactor vessel water level will be established and minimum level prescribed.

h. The standby liquid control system will be operable and in readiness.

i. Fuel handling equipment will have been checked and dry runs completed.

j. The status of protection systems, interlocks, mode switches, alarms, and radiation protection equipment will be prescribed and verified. The high flux trip points will be set for a relatively low power level.

k. Water quality must meet required specifications.

l. A neutron source will be installed near the center of the core.

14.2.12.3.3.3 Description

Prior to fuel loading, control rods and neutron sources and detectors will be installed and tested. Fuel loading will begin at the center of the core and will proceed radially to the fully loaded configuration.

Control rod functional tests, subcriticality checks, and shutdown margin demonstrations will be performed periodically during the loading.

14.2.12.3.3.4 Criteria

Level 1

The partially loaded core must be subcritical by at least 0.38% $\Delta k/k$ with the analytically strongest rod fully withdrawn.

Level 2

Not applicable.

14.2.12.3.4 Test Number 4 - Full Core Shutdown Margin

14.2.12.3.4.1 Purpose

The purpose of this test is to demonstrate that the reactor will be subcritical throughout the first fuel cycle with any single control rod fully withdrawn.

14.2.12.3.4.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Also the following prerequisites will be complete prior to performing the full core shutdown margin test:

a. The predicted critical rod position is available

b. The Standby Liquid Control System is available

c. Nuclear instrumentation is available with neutron count rate of at least two counts per second and signal to noise ratio greater than two.

d. High-flux scram trips are set conservatively low.

14.2.12.3.4.3 Description

This test will be performed in the fully loaded core in the Xenon-free condition. The shutdown margin test will be performed by withdrawing the control rods from the all-rods-in configuration until criticality is reached. If the highest worth rod will not be withdrawn in-sequence, other rods may be withdrawn providing that the reactivity worth is equivalent. The difference between the measured K_{eff} and the calculated K_{eff} for the in-sequence critical will be applied to the calculated value to obtain the true shutdown margin.

14.2.12.3.4.4 Criteria

<u>Level 1</u>

The shutdown margin of the fully loaded, cold (68°F or 20°C), xenon-free core occuring at the most reactive time during the cycle must be at least 0.38% $\Delta k/k$ with the analytically

strongest rod (or its reactivity equivalent) withdrawn. If the shutdown margin is measured at some time during the cycle other than the most reactive time, compliance with the above criterion is shown by demonstrating that the shutdown margin is 0.38% $\Delta k/k$ plus an exposure dependent correction factor which corrects the shutdown margin at that time to the minimum shutdown margin.

Level 2

a. Criticality should occur within $\pm$ 1% k/k of the predicted critical (predicted critical to be determined later).

14.2.12.3.5 Test Number 5 - Control Rod Drive System

14.2.12.3.5.1 Purpose

The purposes of the Control Rod Drive System test are a) to demonstrate that the Control Rod Drive (CRD) System operates properly over the full range of primary coolant temperatures and pressures from ambient to operating, and b) to determine the initial operating characteristics of the entire CRD system.

14.2.12.3.5.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. The Reactor Manual Control System Preoperational Testing must be completed on control rod drives being tested. The Reactor Vessel, Closed Cooling Water System, Condensate Supply System and Instrument Air System must be operational to the extent required to conduct the test.

14.2.12.3.5.3 Description

The CRD tests performed during the startup test program are designed as an extension of the tests performed during the preoperational CRD system tests. Thus, after it is verified that all control rod drives operate properly when installed, they are tested periodically during heatup to assure that there is no significant binding caused by thermal expansion of the core components. A list of all control rod drive tests to be performed during startup testing is given below.

CONTROL ROD DRIVE SYSTEM TESTS

Test Description	Accumulator Pressure	Preop Tests	Reactor Pressure with Core Loaded psig(kg/cm^2) 0	600(42.2)	800(56.2)	Rated
Position Indication		all	all			
Normal Times Insert/Withdraw		all	all			4*
Coupling		all	all***			
Friction			all			4*
Scram	Normal	all	all	4*	4*	all
Scram	Minimum		4*			
Scram	Zero					4*
Scram (Scram Discharge Volume High Level)	Normal	4 (full core scram)				
Scram	Normal					4**

* Value refers to the four slowest CRDs as determined from the normal accumulator pressure scram test at ambient reactor pressure. Throughout the procedure, "the four slowest CRDs" implies the four slowest compatible with rod worth minimizer and CRD sequence requirements.

** Scram times of the four slowest CRDs will be determined at 25%, 50-75% and 100% of rated power during planned reactor scrams.

*** Establish initially that this check is normal operating procedure.

Note: Single CRD scrams should be performed with the charging valve closed (do not ride the charging pump head).

14.2.12.3.5.4 Criteria

Level 1

Each CRD must have a normal withdraw speed less than or equal to 3.6 inches per second (9.14 cm/sec), indicated by a full 12-foot stroke in greater than or equal to 40 seconds.

The mean scram time of all operable CRDs at any reactor pressure must not exceed the following times: (Scram time is measured from the time the pilot scram valve solenoids are deenergized.)

Rod Position	Scram Time (Seconds)
45	0.430
39	0.868
25	1.936
05	3.497

The mean scram time of the three fastest CRDs in a two-by-two array at any reactor pressure must not exceed the following times: (Scram time is measured from the time the pilot scram valve solenoids are deenergized.)

Rod Position	Scram Time (Seconds)
45	0.455
39	0.920
25	2.052
05	3.706

Level 2

Each CRD must have a normal insert or withdraw speed of 3.0 ± 0.6 inches per second (7.62 ± 1.52 cm/sec), indicated by a full 12-foot stroke in 40 to 60 seconds.

With respect to the control rod drive friction tests, if the differential pressure variation exceeds 15 psid (1 kg/cm^2) for a continuous drive in, a settling test must be performed, in which case, the differential settling pressure should not be less than 30 psid (2.1 kg/cm^2) nor should it vary by more than 10 psid (0.7 kg/cm^2) over a full stroke.

14.2.12.3.6 Test Number 6 - SRM Performance and Control Rod Sequence

15.2.12.3.6.1 Purpose

The purpose of this test is to demonstrate that the operational sources, SRM instrumentation, and rod withdrawal sequences provide adequate information to achieve criticality and increase power in a safe and efficient manner. The effect of typical rod movements on reactor power will be determined.

14.2.12.3.6.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. The Control Rod Drive System must be operational.

14.2.12.3.6.3 Description

The operational neutron sources will be installed and source range monitor count-range data will be taken during rod withdrawals to critical and compared with stated criteria on signal and signal count-to-noise count ratio.

A withdrawal sequence has been calculated which completely specifies control rod withdrawals from the all-rods-in condition to the rated power configuration. Critical rod patterns will be recorded periodically as the reactor is heated to rated temperature.

Movement of rods in a prescribed sequence is monitored by the Rod Worth Minimizer, which will prevent out of sequence withdrawal. Also not more than two rods may be inserted out of sequence.

As the withdrawal of each rod group is completed during the power ascension, the electrical power, steam flow, control valve position, and APRM response will be recorded.

14.2.12.3.6.4 Criteria

<u>Level 1</u>

There must be a neutron signal count-to-noise count ratio of at least 2 to 1 on the required operable SRMS or Fuel Loading Chambers.

There must be a minimum count rate of 3 counts/second on the required operable SRMs or fuel loading chambers.

The IRMs must be on scale before the SRMs exceed the rod block set point.

Level 2

Not applicable.

14.2.12.3.7 Test Number 7 - Not Applicable

14.2.12.3.8 Test Number 8 - Not Applicable

14.2.12.3.9 Test Number 16B - Water Level Reference Leg Temperature Measurement

14.2.12.3.9.1 Purpose

The purpose of this test is to measure the reference leg temperature and recalibrate the affected level instruments if the measured temperature is different than the value assumed during the initial calibration.

14.2.12.3.9.2 Prerequisites

The Preoperationl Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. All applicable system instrumentation is installed and calibrated.

14.2.12.3.9.3 Description

To monitor the reactor vessel water level, five level instrument systems are provided. These are:

a. Shutdown Range Level System

b. Narrow Range Level System

c. Wide Range Level System

d. Fuel Zone Level System

e. Upset Range

These systems are used respectively as follows:

a. Water level measurement in cold shutdown conditions (Shutdown Range Level System)

b. Feedwater flow and water level control functions in hot operating conditions (Narrow Range Level System)

c. Safety functions in hot operating conditions (Wide Range Level System)

d. Safety functions in cold shutdown conditions (Fuel Zone Level System)

e. High water level protection, hot operating condition (Upset Range)

The test will be done at rated temperature and pressure and under steady-state conditions and will verify that the reference leg temperature of the level instrument is the value assumed during initial calibration. If not, the instruments will be recalibrated using the measured value.

14.2.12.3.9.4 Criteria

Level 1

Not applicable.

Level 2

The indicator readings on the narrow range level system should agree with ±1.5 inches of the average readings or the reading calculated from the correct reference leg temperatures.

The wide and upset range level system indicators should agree within ±6 inches of the average readings or the readings calculated from the correct reference leg temperatures.

14.2.12.3.10 Test Number 10 - IRM Performance

14.2.12.3.10.1 Purpose

The purpose of this test is to adjust the Intermediate Range Monitor System to obtain an optimum overlap with the SRM and APRM systems.

14.2.12.3.10.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. All source range monitors and pulse preamplifiers, intermediate range monitors and voltage preamplifiers, and average power range monitors have been calibrated in accordance with vendor's instructions.

14.2.12.3.10.3 Description

Initially the IRM system is set to maximum gain. After the APRM calibration, the IRM gains will be adjusted to optimize the IRM overlap with the SRMs and APRMs.

14.2.12.3.10.4 Criteria

<u>Level 1</u>

Each IRM channel must be adjusted so that overlap with the SRMs and APRMs is assured. The IRMs must produce a scram at 96% of full scale.

<u>Level 2</u>

Not applicable.

14.2.12.3.11 Test Number 11 - LPRM Calibration

14.2.12.3.11.1 Purpose

The purpose of this test is to calibrate the Local Power Range Monitoring System.

14.2.12.3.11.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation for calibration has been checked and installed.

14.2.12.3.11.3 Description

The LPRM channels will be calibrated to make the LPRM readings proportional to the neutron flux in the water gap at the chamber elevation. Calibration factors will be obtained through the use of either an off-line or a process computer calculation that relates the LPRM reading to average fuel assembly power at the chamber height.

14.2.12.3.11.4 Criteria

<u>Level 1</u>

Not applicable.

<u>Level 2</u>

Each LPRM reading will be within 10% of its calculated value.

14.2.12.3.12 Test Number 12 - APRM Calibration

14.2.12.3.12.1 Purpose

The purpose of this test is to calibrate the Average Power Range Monitor System.

14.2.12.3.12.2 Prerequisites

The Preoperational Tests have been completed and the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation for calibration has been checked and installed.

14.2.12.3.12.3 Description

A heat balance will generally be made each shift and after each major power level change. Each APRM channel reading will be adjusted to be consistent with the core thermal power as determined from the heat balance. During heatup a preliminary calibration will be made by adjusting the APRM amplifier gains so that the APRM readings agree with the results of a constant heatup rate heat balance. The APRMs should be recalibrated in the power range by a heat balance as soon as adequate feedwater indication is available.

14.2.12.3.12.4 Criteria

Level 1

The APRM channels must be calibrated to read equal to or greater than the actual core thermal power.

Technical Specification Limits on APRM scram and Rod Block shall not be exceeded.

In the startup mode, all APRM channels must produce a scram at less than or equal to 15% of rated thermal power.

Recalibration of the APRM system will not be necessary from safety considerations if at least two APRM channels per RPS trip circuit have readings greater than or equal to core power.

Level 2

If the above criteria are satisfied then the APRM channels will be considered to be reading accurately if they agree with the heat balance to within ±7% of rated power.

14.2.12.3.13 Test Number 13 - Process Computer

14.2.12.3.13.1 Purpose

The purpose of this test is to verify the performance of the process computer under plant operating conditions.

14.2.12.3.13.2 Prerequisites

The Preoperational Tests have been completed and the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Computer diagnostic test completed. Construction and construction testing on each input instrument and its cabling shall be completed.

14.2.12.3.13.3 Description

Computer system program verifications and calculational program validations at static and at simulated dynamic input conditions will be preoperationally tested at the computer supplier's site and following delivery to the plant site. Following fuel loading, during plant heatup and the ascension to rated power, the nuclear steam supply system and the balance-of-plant system process variables sensed by the computer as digital or analog signals will become available. Verify that the computer is receiving correct values of sensed process variables and that the results of performance calculations of the nuclear steam supply system and the balance-of-plant are correct. At steady power conditions the Dynamic System Test Case will be performed.

14.2.12.3.13.4 Criteria

Level 1

Not applicable.

Level 2

Programs OD-1, P1, and OD-6 will be considered operational when:

(1) The MCPR calculated by BUCLE and the process computer either:

a. Are in the same fuel assembly and do not differ in value by more than 2% or,

b. For the case in which the MCPR calculated by the process computer is in a different assembly than that calculated by BUCLE, for each assembly, the MCPR and CPR calculated by the two methods shall agree within 2%.

(2) The maximum LHGR calculated by BUCLE and the process computer either:

a. Are in the same fuel assembly and do not differ in value by more than 2%, or

b. For the case in which the maximum LHGR calculated by the process computer is in a different assembly than that calculated by BUCLE, for each assembly, the maximum LHGR and LHGR calculated by the two methods shall agree within 2%.

(3) The MAPLHGR calculated by BUCLE and the process computer either:

a. Are in the same fuel assembly and do not differ in value by more than 2%, or

b. For the case in which the MAPLHGR calculated by the process computer is in different assembly than that calculated by BUCLE, for each assembly, the MAPLHGR and APLHGR calculated by the two methods shall agree within 2%.

(4) The LPRM calibration factors calculated by BUCLE and the process computer agree to within 2%.

(5) The remaining programs will be considered operational upon successful completion of the static and dynamic testing.

14.2.12.3.14 Test Number 14 - RCIC System

14.2.12.3.14.1 Purpose

The purpose of this test is to verify the proper operation of the Reactor Core Isolation Cooling (RCIC) system over its expected operating pressure range.

14.2.12.3.14.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing.

14.2.12.3.14.3 Description

The RCIC system test consists of two parts: Injection to the condensate storage tank and injection to the reactor vessel. The initial CST injections consist of manual and automatic starts at 150 psi and at rated reactor pressure. The pump discharge pressure during these tests is throttled to 100 psi above reactor pressure. This initial testing is done to demonstrate system operability and making initial controller adjustments. This is followed by vessel injections beginning with cold RCIC hardware. "Cold" being defined as a minimum three days without any kind of RCIC operation.

The vessel injections verify the adequacy of the startup transient and also include steady state controller adjustments. Five consecutive successful system initiations starting from cold conditions and with the same equipment settings are necessary to demonstrate system reliability. Two of these initiations are vessel injection tests with one performed using the controllers on the remote shutdown panel.

After final controller settings are determined, three CST injections at rated pressure and/or 150 psig pressure are done with initially cold RCIC equipment. These runs provide a bench mark for future surveillance testing and provide further assurance of system reliability.

A demonstration of extended operation of 30 minutes of continuous running or until pump and turbine oil temperature is stabilized is scheduled at a convenient time during the test program, probably in conjunction with one of the system reliability tests. During this demonstration, automatic RCIC suction transfer from the CST to the suppression pool will be performed to confirm system stability in this configuration.

During vessel injections all reactor steam is routed to the turbine bypass valves. The steam admission valves of the main and feedwater turbines should be closed whenever the moisture carryover threshold is reached.

14.2.12.3.14.4 Criteria

Level 1

The time from actuating signal to required flow must be less than 30 seconds at any reactor pressure between 150 psig (10.5/kg/cm2) and rated.

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With pump discharge at any pressure between 150 psig (10.5 kg/cm^2) and 1220 psig (85.8 kg/cm^2), the required flow is 600 gpm. (The limit of 1220 psig includes a conservatively high value of 100 psi for line losses. The measured value may be used if available.)

The RCIC turbine must not trip off during startup.

If any Level 1 criteria are not met, the reactor operation will be restricted to the power level defined by Figure 14.2-5. This restriction is in addition to any restrictions defined by the Technical Specification.

Level 2

The turbine gland seal consenser system shall be capable of preventing steam leakage to the atmosphere.

The differential pressure switch for the RCIC steam supply line high flow isolation trip shall be adjusted to actuate at 300% of the maximum required steady state flow.

14.2.12.3.15 Test Number 15 Not Applicable

14.2.12.3.16 Test Number 16 - Selected Process Temperatures

14.2.12.3.16.1 Purpose

The purpose of this procedure is to (1) verify the setting of low flow control limiter for the recirculation pumps to avoid coolant temperature stratification in the reactor pressure vessel bottom head region, (2) assure that the measured bottom head drain temperature corresponds to bottom head coolant temperature during normal operations and (3) identify any reactor operating modes during recirculation pump restarts or one pump operation that cause temperature stratification.

14.2.12.3.16.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. System and test instrumentation have been calibrated.

14.2.12.3.16.3 Description

The adequacy of bottom drain line temperature sensors will be determined by comparing it with recirculation loop coolant temperature when core flow is 100% of rated.

During initial heatup while at hot standby conditions, the bottom drain line temperature, recirculation loop suction temperature and applicable reactor parameters are monitored as the reciruclation flow is slowly lowered to either minimum stable flow or the low recirculation pump speed minimum valve position whichever is the greater. The effects of cleanup flow, CRD flow and power level will be investigated as operational limits allow. Utilizing this data it can be determined whether coolant temperature stratification occurs and if so, what minimum recirculation flow will prevent it.

Monitoring the preceding information during planned pump trips and restarets will determine if temperature stratification occurs in the idle recirculation loops or in the lower plenum when one or more loops are inactive.

All data will be analyzed to dermined if changes in operating procedures are required.

14.2.12.3.16.4 Criteria

Level 1

a. The reactor recirculation pumps shall not be started nor flow increased unless the coolant temperatures between the steam dome and bottom head drain are within 100°F (56°C).

b. The recirculation pump in an idle loop must not be started unless the loop suction temperature is within 50°F (28°C) of the steam dome temperature.

Level 2

During two pump operation at rated core flow, the bottom head temperature as measured by the bottom drain line thermocouple should be within 30°F (17°C) of the recirculation loop temperatures.

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14.2.12.3.16.4 Criteria

Level 1

a. The reactor recirculation pumps shall not be started nor flow increased unless the coolant temperatures between the steam dome and bottom head drain are within 100°F (56°C).

b. The recirculation pump in an idle loop must not be started unless the loop suction temperature is within 50°F (28°C) of the steam dome temperature.

Level 2

During two pump operation at rated core flow, the bottom head temperature as measured by the bottom drain line thermocouple should be within 30°F (17°C) of the recirculation loop temperatures.

14.2.12.3.17 Test Number 17 - System Expansion

14.2.12.3.17.1 Purpose

The purpose of this test is to verify that piping systems are free and unrestrained in regard to thermal expansion and that suspension components are functioning in the specified manner. This test also verifies that all accessible snubbers installed on safety-related systems whose normal operating temperature is greater than 250°F have adequate swing clearance to accommodate system thermal expansion.

The test also provides data for calculation of stress levels in nozzles and weldments.

14.2.12.3.17.2 Prerequisites

Necessary Preoperational Tests have been completed. The pre-heatup examination program relating to component supports as contained in the WNP-2 Preservice Inspection Program Plan has been completed. The POC has reviewed, and the Plant Manager has approved the test procedure and initiation of testing. Instrumentation has been installed and calibrated.

14.2.12.3.17.3 Description

During the Power Ascension Testing (PAT) Program, hot condition piping support performance and settings will be verified in accordance with System Test Instruction (STI), "Piping System Expansion and Vibration Tests." Hanger positions of major equipment and piping in the nuclear steam supply system and auxiliary systems will be prerecorded during the initial thermal cycle and after shakedown has taken place (normally about three cycles). At specified temperature intervals during initial system heatup and following cooldown, visual inspections are made by personnel certified to Level II or Level III for VT-3 and VT-4 to assure components are free to move as designed. Adjustments are made as necessary. Snubber thermal movement and swing clearance is verified during each inspection. For systems inspected that do not attain operating temperature, swing clearance for projected snubber movement will be verified by observation and/or calculation.

Devices for measuring continuous pipe deflections are mounted on main steam, recirculation, feedwater, RCIC, and selected safety/relief valve discharge lines. Motion measured during heatup is compared with calculated values.

14.2.12.3.17.4 Criteria

Level 1

Thermally induced displacement of system components shall be unrestrained, with no evidence of binding or impairment.

Spring hangers shall not be bottomed out or have the spring fully stretched.

Snubbers shall not reach the limits of their travel. The displacements at the established transducer locations used to measure pipe deflections shall not exceed the allowable values. The allowable values of displacement shall be based on not exceeding ASME Section III Code stress allowables.

Level 2

Spring hangers will be in their operating range (between the hot and cold settings).

Snubber settings must be in the operating range and should be about the midpoint of the total travel at operating temperature, or as specified on the hanger detail drawing.

The displacements at the established transducer locations shall not exceed the expected values.

14.2.12.3.18 Test Number 18 - Core Power Distribution

14.2.12.3.18.1 Purpose

The purpose of this test is to determine the reproducibility of the TIP system readings.

14.2.12.3.18.2 Prerequisites

The Preoperatonal Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. The TIP detector and dummy detector, ball valve time delay, core top and bottom limits, clutch, x-y recorder, and purge system will have been shown to be operational. Instrumentation has been calibrated and installed.

14.2.12.3.18.3 Description

TIP reproducibility consists of a random noise component and a geometric component. The geometric component being due to variation in the water gap geometry and TIP tube orientation from TIP location to location. Measurement of these components is obtained by taking repetitive TIP readings at a single TIP location, and by analyzing pairs of TIP readings taken at TIP locations which are symmetrical about the core diagonal of fuel loading symmetry.

One set of TIP data will be taken at the 50% power level and at least one other set at 75% power or above.

The TIP data will be taken with the reactor operating with an octant symmetric rod pattern and at steady state conditions.

The total TIP reproducibility is obtained by dividing the standard deviation of the symmetric TIP pair nodal ratios by $\sqrt{2}$. The nodal TIP ratio is defined as the nodal BASE value of the TIP in the lower right half of the core divided by its symmetric counterpart in the upper left half. The total TIP reproducibility value that is compared with the test criterion is the average value of the data sets taken.

The random noise uncertainty is obtained from successive TIP runs made at the common hole, with each of the TIP machines making six runs. The standard deviation of the random noise is derived by taking the square root of the average of the variances at nodal levels 5 through 22, where the nodal variance is obtained from the fractional deviations of the successive TIP values about their nodal mean value.

The geometric component of TIP reproducibility is obtained by statistically subtracting the random noise component from the total TIP reproducibility.

14.2.12.3.18.4 Criteria

<u>Level 1</u>

Not applicable.

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Level 2

The total TIP uncertainty (including random noise and geometrical uncertainties) obtained by averaging the uncertainties for all data sets shall be less than 6.0%.

The data acquired for random noise uncertainty does not have specific acceptance criteria value and is used only to aid in the analysis of the TIP uncertainty.

14.2.12.3.19 Test Number 19 - Core Performance

14.2.12.3.19.1 Purpose

The purposes of this test are a) to evaluate the core thermal power and b) to evaluate the following core performance parameters: 1) maximum linear heat generation rate (MLHGR), 2) minimum critical power ratio (MCPR) and 3) maximum average planar linear heat generation rate (MAPLHGR).

14.2.12.3.19.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. System instrumentation installed and calibrated and test instrumentation calibrated.

14.2.12.3.19.3 Description

The core performance evaluation is employed to determine the principal thermal and hydraulic parameters associated with core behavior. These parameters are:

Core flow rate
Core thermal power level
MLHGR
MAPLHGR
MCPR

The core performance parameters listed above will be evaluated by manual calculation techniques described in Startup Test Instruction 19 or may be obtained from the process computer.

If the process computer is used as a primary means to obtain these parameters, it must be proven that it agrees with BUCLE within 2% on all thermal parameters (see Test Number 13), or the results must be corrected to do so. If the BUCLE and process computer results do not agree within 2% for any thermal parameter, the parameter calculated by the process computer will be corrected by a multiplication factor to bring it within the 2% criteria.

14.2.12.3.19.4 Criteria

Level 1

The Maximum Linear Heat Generation Rate (MLHGR) of any rod during steady-state conditions shall not exceed the limit specified by the Plant Technical Specifications.

The steady-state Minimum Critical Power Ratio (MCPR) shall not exceed the limits specified by the Plant Technical Specifications.

The Maximum Average Linear Heat Generation Rate (MAPLHGR) shall not exceed the limits specified by the Plant Technical Specifications.

Steady-state reactor power shall be limited to rated MWT and values on or below the design flow control line. A core flow of 100 percent rated will not be exceeded.

Level 2

Not applicable.

14.2.12.3.20 Test Number 20 - Electrical Output and Heat Rate

14.2.12.3.20.1 Purpose

The purpose of this test is to demonstrate that the plant net electrical output and net heat rate requirements are satisfied.

14.2.12.3.20.2 Prerequisites

The Preoperatonal Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing.

14.2.12.3.20.3 Description

The plant gross electrical output and net heat rate will be measured during sustained operation at rated conditions. The gross electrical output is defined as the gross electrical output mmeasured at the generator terminals and must be maintainned for 100 hours. The net plant heat rate is defined as the thermal output from the reactor less the thermal content in the feedwater supplied to the reactro all divided by the net electrical output. All corrections for losses and auxiliary loads will be agreed to prior to the start of the test.

The 2 hour net plant heat rate test would normally be done although this is not necessary.

14.2.12.3.20.4 Criteria

Level 1

The guaranteed performance calls for a gross output of 1,154,745 KWe at a reactor thermal power of 3322 MW and a net plant heat rate of 9,840 BTU/Kwhr.

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14.2.12.3.21 Test Number 21 - Core Power-Void Mode

14.2.12.3.21.1 Purpose

The purpose of this test is to measure the stability of the core power-void dynamic response and to demonstrate that its behavior is within specified limits.

14.2.12.3.21.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. System instrumentation installed and calibrated and test and instrumentation calibrated.

14.2.12.3.21.3 Description

The core power void loop mode, that results from a combination of the neutron kinetics and core thermal hydraulic dynamics, is least stable near the natural circulation end of the rated 100 percent power rod line. A fast change in the reactivity balance is obtained by moving a very high worth rod only 1 or 2 notches. The recorded response must be carefully examined for lower stability mode responses in the 0.4 Hz area. A special mid pass filter is placed on the flux signals and dome pressure to emphasize this area, as well as to suppress noise in the signal background. The principal control systems will be in the normal modes for operating conditions at the test condition.

14.2.12.3.21.4 Criteria

Level 1

The decay ratio must be less than 1.0 for each process variable that exhibits oscillatory response to control rod movement.

Level 2

Not applicable

(DELETE)

14.2.12.3.22 Test Number 22 - Pressure Regulator

14.2.12.3.22.1 Purpose

The purposes of this test are: a) to determine the optimum settings for the pressure control loop by analysis of the transients induced in the reactor pressure control system by means of the pressure regulators, b) to demonstrate the takeover capability of the backup pressure regulator upon failure of the controlling pressure regulator and to set spacing between the set points at an appropriate value and c) to demonstrate smooth pressure control transition between the control valves and bypass valves when reactor steam generation exceeds steam used by the turbine.

14.2.12.3.22.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.22.3 Description

The pressure set point will be decreased rapidly and then increased rapidly by about 10 psi (0.7 kg/cm^2) and the response of the system will be measured in each case. It is desirable to accomplish the set point change in less than 1 second. At specified test conditions the load limit setpoint will be set so that the transient is handled by control valves, bypass valves and both. The backup regulator will be tested by simulating a failure of the operating pressure regulator so that the backup regulator takes over control. The response of the system will be measured and evaluated and regulator settings will be optimized. Because the near step transient occurs downstream of the log filter, this disturbance yields valuable stability data in the midfrequency range (i.e., 0.1-3.0 Hz).

The principal control systems will be in their normal operating mode for the given test condition. In addition, at test conditions 3, 5, and 6 the test will be performed with the recirculation control system in the local manual control mode.

14.2.12.3.22.4 Criteria

Level 1

The decay ratio must be less than 1.0 for each process variable that exhibits oscillatory response to pressure regulator changes.

Level 2

In all tests the decay ratio is expected to be less than or equal to 0.25 for each process variable that exhibits oscillatory response to pressure regulator changes when the plant is operating above the lower limit setting of the Master Flow Controller.

Pressure control deadband, delay, etc., shall be small enough that steady-state limit cycles, if any, shall produce turbine steam flow variations no larger than ±0.5% of rated flow as measured by the gross generated electrical power.

Optimum gain values for the pressure control loop shall be determined to give the fastest return from the transient condition to the steady-state condition within the limits of the above criteria.

During the simulated failure of the controlling pressure regulator, if the setpoint of the backup pressure regulator is optimumly set, the backup regulator shall control the transient such that the peak neutron flux and/or peak vessel pressure remain below the scram settings by 7.5% and 10 psi respectively.

Following a ±10 psi (0.7 kg/cm^2) pressure setpoint adjustment, the time between the setpoint change and the occurrence of the pressure peak shall be 10 seconds or less when in the recirculation POS mode.

14.2.12.3.23 Test Number 23 - Feedwater System

14.2.12.3.23.1 Purpose

The purposes of this test are a) to adjust the feedwater control system for acceptable reactor water level control, b) to demonstrate stable reactor response to subcooling changes, c) to demonstrate the capability of the automatic core flow runback feature to prevent low water level scram following the trip of one feedwater pump.

14.2.12.3.23.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.23.3 Description

Reactor water level set point changes of approximately 5 to 6 inches (12.5 to 15.3 cm) will be used to evaluate and adjust the feedwater control system settings for all power and feedwater pump modes. The level set point changes will also demonstrate core stability to subcooling changes.

Under normal operation with one feedwater loop in manual, a manual flow step will be initiated and each loop's flow response will be determined.

One of the operating feedwater pumps will be tripped and the automatic recirculation flow runback circuit will act to drop power to within the remaining capacity of the system. Prior to the performance of this test a review of the recirculation flow limit or calibration and trip logic will be performed to ensure that the runback circuit will function properly.

The condensate/feedwater system will be studied to determine the single failure that will cause the largest loss in feedwater heating. This event will then be performed at between 80 and 90% power with the recirculation flow near its rated value'

The other principal control systems will be in their normal operating mode for the given test condition. In addition, at test conditions 3, 5 and 6 the level setpoint changes will be performed with the recirculation control system in the local manual contol mode.

Pressure, flow and controller data will be taken at as high a power level as necessary to allow the determination of the maximum feedwater flow runout capability. These data will be compared with the FSAR values and the impact on thermal limits determined.

14.2.12.3.23.4 Criteria

Level 1

The decay ratio must be less than 1.0 for each process variable that exhibits oscillatory response to feedwater system changes.

For the feedwater heater loss test, the maximum feedwater temperature decrease due to a single failure must be less than or equal to 100°F. The resultant MCPR must be greater than the fuel thermal safety limit.

The feedwater flow runout capability must not exceed the assumed value in Chapter 15, "Transient Analysis".

For the feedwater heater loss test, the increase in simulated heat flux cannot exceed the predicted level 2 value by more than 2%. The predicted value will be based on the actual test values of feedwater temperature change and power level.

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Level 2

The decay ratio is expected to be less than or equal to 0.25 for each process variable that exhibits oscillatory response to feedwater system changes when the plant is operating above the lower limit of the Master Flow Controller.

The automatic core flow runback feature will prevent a scram from low water level with a 3-inch margin following a trip of one of the operating feedwater pumps.

With the condensate system operating normally, the control system shall prevent pump damage due to cavitation.

For the loss of feedwater heater test, the increase in simulated heat flux cannnot exceed the predicted value referenced to the actual feedwater temperature change and power level.

The open loop dynamic flow response of each feedwater actuator (turbine or value) to small (>10%) step disturbances shall be:

Maximum time to 10% of a step disturbance	$\leq$ 1.1 sec.
Maximum time from 10% to 90% of a step disturbance	$\leq$ 1.9 sec.
Settling time to within $\pm$ 5% of the final value (% based upon step size)	$\leq$ 14.0 sec.
Peak overshoot (% of step disturbance)	$\leq$ 15%

The average rate of response of the feedwater actuator to large (>20% of pump flow) step disturbances shall be between 10 and 25% rated feedwater flow/second. This average response rate will be assessed by determining the time required to pass linearly through the 10 and 90% response points.

14.2.12.3.24 Test Number 24 - Turbine Valve Surveillance

14.2.12.3.24.1 Purpose

The purpose of this test is to demonstrate the acceptable procedures and maximum power levels for periodic surveillance testing of the main turbine throttle, governor, interceptor, reheat stop and bypass valves without producing a reactor scram.

14.2.12.3.24.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.24.3 Description

Individual main turbine control, stop and bypass valves are tested routinely during plant operation as required for turbine surveillance testing. At several test points the response of the reactor will be observed, and although it is not required, it is recommended that the maximum possible power level for performance of these tests along the 100% load line be established. First actuation should be between 45 and 65% power, and used to extrapolate to the next test point between 70 and 90% power and ultimately to the maximum power test condition with ample margin to scram. Note proximity to APRM flow bias scram point. Each valve test will be manually initiated and reset. Rate of valve stroking and timing of the close-open sequence will be such that the minimum practical disturbance is introduced. If the stroking and timing rates are changed the test will be repeated to ensure acceptable performance of the periodic surveillance test.

14.2.12.3.24.4 Criteria

<u>Level 1</u>

The decay ratio of any oscillatory response must be less then 1.0.

<u>Level 2</u>

a. Peak neutron flux must be at least 7.5% below the scram trip setting. Peak vessel pressure must remain at least 10 psi below the high pressure scram setting.

b. Peak steam flow in each line must remain 10% below the high flow isolation trip setting.

c. The decay ratio of any oscillatory response must be less than 0.25, when operating above the minimum core flow of the recirculation master manual mode.

14.2.12.3.25 Test Number 25 - Main Steam Isolation Valves

14.2.12.3.25.1 Purpose

The purposes of this test are a) to functionally check the main steam line isolation valves (MSIVs) for proper operation at selected power levels, b) to determine reactor transient behavior during and following simultaneous full closure of all MSIVs, c) to determine isolation valves closure time at rated conditions, and d) to determine maximum power at which a single valve closures can be made without scram.

14.2.12.3.25.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.25.3 Description

At 5% power or greater, both slow and fast single valve closure will be performed. A test of the simultaneous full closure of all MSIVs will be performed at greater than 75% rated thermal power. Correct performance of the RCIC and relief valves will be shown. Reactor process variables will be monitored to determine the transient behavior of the system during and following the Main Steam Line (MSL) isolation. The maximum power conditions at which individual valve full closure tests can be performed without a reactor scram is to be established, and one individual valve full closure test will be performed on the 100% power load line to check ability to perform surveillance tests on this load line.

The MSIV closure times will be determined from the MSL isolation data by determining the time interval from de-energization of the MSIV pilot solenoids to the 90% closed position plus 1/8 of the period of time between 10% closed and 90% closed positions.

14.2.12.3.25.4 Criteria

Level 1

Individual Valve Closure

MSIV closure time, exclusive of electrical delay shall be no faster than 3.0 seconds (average of the fastest valve in each steam line) and no slower than 5.0 seconds, (each valve, not averaged). The electrical time delay at 100% open shall be less than or equal to 0.5 second and the fastest valve closure time shall be $\geq$2.5 seconds.

Full Reactor Isolation

The positive change in vessel dome pressure occurring within 30 seconds after closure of all MSIV valves must not exceed the Level 2 criteria by more than 25 psi. The positive change in simulated heat flux shall not exceed the Level 2 criteria by more than 2% of rated value.

Feedwater control system settings must prevent flooding of the steam lines.

Level 2

Individual Valve Closure

During full closure of individual valves peak vessel pressure must be 10 psi (0.7 kg/cm^2) below scram, peak neutron flux must be 7.5% below scram, and steam flow in individual lines must be 10% below the isolation trip setting. The peak heat flux must be 5% less than its trip point.

Full Reactor Isolation

The RCIC system shall adequately maintain water level. The relief valves must reclose properly (without leakage) following the pressure transient.

The positive change in vessel dome pressure and simulated heat flux occurring within the first 30 seconds after the closure of all MSIV must not exceed the predicted values. These values will be referenced to actual test conditions of initial power level and dome pressure and will use BOL nuclear data. In addition, it will be corrected for the measured control rod insertion speed and the time from the start of MSIV motion to the start of control rod motion.

14.2.12.3.26 Test Number 26 - Relief Valves

14.2.12.3.26.1 Purpose

The purposes of this test are a) to verify the proper operation of the main system relief valves, b) to verify that the discharge piping is not blocked, c) to verify their proper seating following operation, d) to obtain signature information of relief valve response for subsequent comparisons, and e) to determine their capacities.

14.2.12.3.26.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.26.3 Description

The main steam relief valves will each be opened using the "manual" control mode so that at any time only one is open. During heatup at 250 psig (17.5 kg/cm^2), each valve will be opened and closed to demonstrate proper functioning. Flow verification of each relief valve will be determined at rated pressure by observing bypass or control valve motion and by observing a change in discharge T/C readings. Proper reseating of each relief valve will be verified by observation of temperatures in the relief valve discharge piping. At selected test conditions each valve will be manually actuated and appropriate system parameters recorded during the transient. Data analysis will include a comparison of the system response during each of the valve actuations. Capacity of each relief valve will be determined at rated pressure by the amount of bypass or control valve closure required to maintain reactor pressure.

14.2.12.3.26.4 Criteria

<u>Level 1</u>

There should be positive indication of steam discharge during the manual actuation of each valve.

The sum of capacity measurements from all relief valves shall be equal to or greater than rated, ±2% corrected for inlet pressure of 1112 psig.

Level 2

Relief valve leakage shall be low enough that the temperature measured by the thermocouples in the discharge side of the valves returns to within 10°F (5.6°C) of the temperature recorded before the valve was opened. The thermocouples are expected to be operating properly.

The pressure regulator must satisfactorily control the reactor transient and close the control valves or bypass valves by an amount equivalent to the relief valve discharge. The valve transients recorder signatures for each valve must be returned to San Jose for relative system response comparison.

Each relief valve shall have a capacity between 90% and 135% of its expected value corrected to an inlet pressure of 1112 psig.

No more than 25% of the relief valves may have an individual corrected flow rate that is less than expected.

The transient recorder signatures for each valve must be analyzed for relative system response comparison.

14.2.1.3.27 Test Number 27 - Turbine Trip and Generator Load Rejection

14.2.12.3.27.1 Purpose

The purpose of this test is to demonstrate the response of the reactor and its control systems to protective trips in the turbine and generator.

14.2.12.3.27.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. All controls and interlocks are checked and instrumentation calibrated. The plant electrical system will be aligned in the normal mode for the operating condition at which the test is performed.

14.2.12.3.27.3 Description

Both the turbine and the main generator will be tripped at selected power levels. Several reactor and turbine operating parameters will be monitored to evaluate the response of the bypass valves, relief valves, and reactor protection system (RPS). Additionally, the peak values and change rates of reactor steam pressure and heat flux will be determined. The effect of recirculation pump overspeed, if any, will be checked during the generator load rejection. The ability to ride through a load rejection within bypass capacity without a scram will also be demonstrated.

14.2.12.3.27.4 Criteria

Level 1

For Turbine and Generator trips there should be a delay of less than 0.1 second following the beginning of control or stop valve closure before the beginning of bypass valve oening. The bypass valves should be opened to a point corresponding to greater than or equal to 80 percent of their capacity within 0.3 second from the beginning of control or stop valve closure motion.

Feedwater system settings must prevent flooding of the steam line following these transients.

The two pump drive flow coastdown transient during the first three seconds must be equal to or faster than that specified in Test 30.

The positive change in vessel dome pressure occurring within 30 seconds after either generator or turbine trip must not exceed the Level 2 criteria by more than 25 psi.

The positive change in simulated heat flux shall not exceed the Level 2 criteria by more than 2% of the rated value.

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Level 2

The MSIV shall not be tripped closed at anytime during the test transients.

The positive change in vessel dome pressure and in simulated heat flux which occur within the first 30 seconds after the initiation of either generator or turbine trip must not exceed the predicted values.

Predicted values will be referenced to actual test conditions of initial power level and dome pressure and will use BOL (Beginning of Life) nuclear data. In addition, the predictions will be corrected for the measured control rod insertion time and the delay from beginning of turbine control valve or stop valve motion to the generation of the scram signal. The predicted pressure and heat flux will be corrected for the actual measured values of these two parameters.

For the Generator trip within the bypass valves capacity, the reactor shall not scram for initial thermal power values within that bypass valve capacity.

14.2.12.3.28 Test Number 28 - Shutdown From Outside The Main Control Room

14.2.12.3.28.1 Purpose

To demonstrate that the reactor can be brought from a normal initial steady-state power level to the point where cooldown is initiated and under control with reactor vessel pressure and water level controlled from outside the main control room. In addition, the operation of the shutdown cooling/suppression pool cooling modes of the RHR system from the remote shutdown panel will be demonstrated.

14.2.12.3.28.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.28.3 Description

The test will simulate the reactor shutdown following a main control room evacuation. The reactor will be scrammed from a normal steady-state condition and the MSIVs closed prior to evacuation in compliance with plant emergency operating procedures. However, the capability exists to manually scram the reactor and close the MSIVs from outside the control room. Following this event, the vessel water level and pressure will be controlled from the remote shutdown panel. During the test the control room staff will be at full strength to perform actions on systems not required for an emergency shutdown. Reactor pressure will be reduced via relief valve actuation and suppression pool cooling will be placed in service. When reactor pressure falls below 135 psig, RHR shutdown cooling will be placed in service in a controlled manner to reduce reactor coolant temperature by at least 50°F.

14.2.12.3.28.4 Criteria

Level 1

Not applicable.

Level 2

During a simulated main control room evacuation, the reactor must be brought to the point where cooldown is

initiated and under control. The reactor vessel pressure and water level are controlled using equipment and controls outside the main control room.

14.2.12.3.29 Test Number 29 - Recirculation Flow Control

14.2.12.3.29.1 Purpose

The purposes of this test are a) to demonstrate the core flow system's control capability over the entire flow control range, including valve position, core flow, neutron flux and load following modes of operation, and b) to determine that all electrical compensators and controllers are set for desired system performance and stability.

14.2.12.3.29.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. All controls are checked and instrumentation calibrated.

14.2.12.3.29.3 Description

The testing of the Recirculation Flow Control System follows a "building block" approach while the plant is ascending from flow to high power levels. Components and inner control loops are tested first, followed by drive flow control and plant power maneuvers to adjust and then demonstrate the outer loop controller performance. By far the most extensive testing will be performed along the mid power load line where most of the systems final adjustments are determined. The core power distribution will be adjusted by control rods to permit broader range of maneuverability with respect to Preconditioning Cladding Interim Operating Management Recommendation (PCIOMR). In general, the controller dials and gains will be raised to meet the maneuvering performance objectives. Thus the system will be set to be the slowest that will perform satisfactorily, in order to maximize stability margins and to minimize equipment wear by avoiding controller overactivity. The other principal control systems will be in their normal operating mode for the given test condition.

Because of PCIOMR power maneuvering rate restrictions, the fast flow maneuvering adjustments are performed along a mid power rod line, and an extrapolation made to the expected results along the 100 percent rod.

The utility has the option to decide to:

a. Perform the faster power changes on the 100 percent rod line that are greater than what the PCIOMR allow, or

b. To accept the mid power load line demonstrations as acceptable proof of maneuverability.

For immediate commercial operation, the Auto modes will be set slower, and the operator will limit Manual mode. If PCIOMR's are ever withdrawn the tested faster Auto settings can be inserted onto the controller with only a brief dynamic test, rather than a full startup test.

14.2.12.3.29.4 Criteria

Level 1

The transient response of any recirculation system-related variables to any test input must not diverge.

Level 2

Recirculation system-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25.

The maximum rate of change of valve position is 10 $\pm$ 1%/sec.

The overshoot after a small position demand input (1 to 5%) step shall be <10% of magnitude of input.

Gains shall be set to give as fast a response as possible to achieve a rise time of $\leq$0.45 seconds for small position demand inputs of 1 to 5%. The delay time should be $\leq$0.15 seconds.

Flow loops are for the purpose of maintaining equal steady state in the two loops. Flow loop gains should be set to correct a flow unbalance in about 15 seconds.

Flux overshoot to a flux demand step shall not exceed 2% of full power.

Flux controller time constants and gain shall be adjusted to give fastest possible response within the overshoot limit given in 14.2.12.3.29.3.a. The response time shall be $\leq$2.8 seconds, when the magnitude of the demand step is within the setting of the flux error limiter. Nominal flux error setting is $\pm$20% of full power.

The master controller time constants and gains and steam pressure level setpoint parameters shall be set to give the response necessary to meet plant load following requirements as stated in the contract.

The response to a step input of less than 10% in load demand shall be such that the load demand error is less than 10% of magnitude of step within 10 seconds.

When a load demand step of greater than 10% is applied (N%), error must be less than 10% of step in N seconds.

14.2.12.3.30 Test Number 30 - Recirculation System

14.2.12.3.30.1 Purpose

The purposes of this test are a) to determine transient responses and steady-state conditions following recirculation pump trips at selected reactor power levels, b) to obtain recirculation system performance data, c) to verify that no recirculation system cavitation occurs on the operable region of the power/flow map, and d) to verify that the feedwater control system can satisfactorily control water level without a resulting turbine trip scram following single recirculation pump trips.

14.2.12.3.30.2 Prerequisites

The Preoperational Tests have been completed and the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate. All control systems will be in their normal operating mode for the given test conditions.

14.2.12.3.30.3 Description

Single recirculation pump trips with LFMG set breaker locked open will be made at near rated flow at 75% and 100% power levels, by opening 6190 VAC breaker. Simultaneous trip of both recirculation pumps without transfer to LFMG set power supply will be made at near rated flow in Test Condition 3 by using the RPT two pump circuit trip system. Reactor operating parameters will be recorded during the transient and at steady-state conditions to experimentally determine the power and flow coastdown rates.

Both the jet pumps and the recirculation pumps will cavitate at conditions of high flow and low power where NPSH demands are high and little feedwater subcooling occurs. However, the recirculation flow will automatically runback upon sensing a decrease in feedwater flow, to lower the reactor power. The maximum recirculation flow is limited by appropriate stops which will run back the recirculation flow from the possible cavitation region. It will be verified that these limits are sufficient to prevent operation where recirculation pump or jet pump cavitation occurs.

14.2.12.3.30.4 Criteria

Level 1

The two pump drive flow coastdown transient during the first 3 seconds must be equal to or greater than that specified on Figure 14.2-6.

Level 2

The reactor water level margin to avoid a higher level trip shall be >3.0 inches during the one pump trip.

The simulated heat flux margin to avoid a scram shall be $\geq$5.0% both during the one pump trip and also during the recovery.

The APRM margin to avoid a scram shall be >7.5% during the one pump trip recovery.

Runback logic shall have settings adequate to prevent operation in areas of potential cavitation.

If the Level 1 criterion for the two pump trip coastdown transient is not met, the data shall be analyzed as soon as possible to insure compatibility with the safety analysis.

14.2.12.3.31 Test Number 31 - Loss of Turbine-Generator and Offsite Power

14.2.12.3.31.1 Purpose

The purpose of this test is to determine the reactor transient performance during the loss of the main generator and all offsite power, and to demonstrate acceptable performance of the station electrical supply system.

14.2.12.3.31.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate. The plant electrical system will be aligned in the normal mode for the operating condition at which the test is performed.

14.2.12.3.31.3 Description

The loss of auxiliary power test will be performed at 20 to 30% of rated power. The proper response of reactor plant equipment, automatic switching equipment, and the proper sequencing of the diesel generator load will be checked. Appropriate reactor parameters will be recorded during the resultant transient. The trip will be initiated by tripping the main turbine and opening the breakers supplying offsite power or preventing the closure of breakers supplying offsite power. The loss of offsite power conditions will be maintained for a minimum of 30 minutes to demonstrate proper D-G system performance.

14.2.12.3.31.4 Criteria

Level 1

a. Reactor protection system actions shall prevent violation of full thermal limits.

b. All safety systems, such as the Reactor Protection System, the diesel generators, and HPCS must function properly without manual assistance, and HPCS and/or RCIC system action, if necessary, shall keep the reactor water level above the initiation level of the Low Pressure Core Spray, LPCI and ADS systems.

Level 2

Not applicable.

14.2.12.3.32 Not Applicable

14.2.12.3.33 Test Number 33 - Piping Vibration

14.2.12.3.33.1 Purpose

The purpose of this test is to verify that the reactor main steam, recirculation, feedwater, SRV discharge, and RCIC piping vibration are responding as predicted.

14.2.12.3.33.2 Prequisites

The Preoperational Tests have been completed, the POC has reviewed, and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.33.3 Description

During reactor operation, it is desirable to show that destructive level piping vibrations do not occur by measuring vibration at steady state and during various planned transients.

14.2.12.3.33.4 Criteria

Level 1

The measured amplitude (peak-to-peak) of main steam and recirculation line vibration shall not exceed the maximum allowable displacements.

Level 2

The measured amplitude (peak-to-peak) of vibration shall not exceed the expected values.

(DELETED)

14.2.12.3.34 Test Number 34 - RPV Internals Vibration

14.2.12.3.34.1 Purpose

The purpose of this test is to provide information needed to confirm the similarity between the reactor internals design and the prototype with respect to flow induced vibration. Testing is in response to NRC Regulatory Guide 1.20 for a vibration measurement program for nonprototype, Category IV reactor internals.

14.2.12.3.34.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrted as appropriate.

14.2.12.3.34.3 Description

During reactor operation, it is desirable to show that destructive levels of vibrations do not occur by measuring vibrations levels as steady-state and during various planned transients.

Sensors used for the measurements are resistance wire strain gages and accelerometers with double integrating output signal conditioning. Sensors will be installed in a manner to sense the most probable mode of vibration as indicated by analysis.

The test program consists of hot power tests performed with the system at normal operating pressure and temperature.

During the vibration test the vibration amplitudes and frequencies obtained from the sensors mounted on the various components will be monitored and recorded. The measured amplitudes and frequencies are then compared to the acceptance criteria to assure that all measured vibration amplitudes are within acceptable levels.

14.2.12.3.34.4 Criteria

<u>Level 1</u>

The peak stress intensity may exceed 10,000 psi (single amplitude) when the component deformed in a manner corresponding to one of its normal or natural modes but the fatigue usage factor must not exceed 1.0.

Level 2

The peak stress intensity shall not exceed 10,000 psi (single amplitude) when the component is deformed in a manner corresponding to one of its normal or natural modes. This is the low stress limit which is suitable for sustained vibration in the reactor environment for the design life of the reactor components.

BLANK

14.2.12.3.35 Test Number 35 - Recirculation System Flow Calibration

14.2.12.3.35.1 Purpose

The purpose of this test is to perform complete calibration of the installed recirculation system flow instrumentation.

14.2.12.3.35.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.35.3 Description

During the testing program at operating conditions which allow the recirculation system to be operated at rated flow at rated power, the jet pump flow instrumentation will be adjusted to provide correct flow indication based on the jet pump flow. After the relationship between drive flow and core flow is established, the flow biased APRM/RBM system will be adjusted to match this relationship.

14.2.12.3.35.4 Criteria

<u>Level 1</u>

Not applicable.

<u>Level 2</u>

Jet pump flow instrumentation shall be adjusted such that the jet pump total flow recorder will provide a correct core flow indication at rated conditions.

The APRM/RBM flow-bias instrumentation shall be adjusted to function properly at rated conditions.

14.2.12.3.36 Test Number 70 - Reactor Water Cleanup System

14.2.12.3.36.1 Purpose

The purpose of this test is to demonstrate specific aspects of the mechanical operability of the Reactor Water Cleanup System. (This test, performed at rated reactor pressure and temperature, is actually the completion of the preoperational testing that could not be done without nuclear heating.)

14.2.12.3.36.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.36.3 Description

With the reactor at rated temperature and pressure process variables will be recorded during steady state operation in three modes as defined by the System Process Diagram: Blowdown, Hot Standby, and Normal.

14.2.12.3.36.4 Criteria

Level 1

Not applicable.

Level 2

The temperature at the tube side outlet of the non-regenerative heat exchangers shall not exceed 130°F in the blowdown mode and shall not exceed 120°F in the normal mode.

The pump available NPSH will be 13 feet or greater during the hot standby mode defined in the process diagrams.

The cooling water supplied to the non-regenerative heat exchangers shall be within the flow and outlet temperature limits indicated in the process diagrams. (This is applicable to "normal" and "blowdown" modes.)

14.2.12.3.37 Test Number 71 - Residual Heat Removal System

14.2.12.3.37.1 Purpose

The purpose of this test is to demonstrate the ability of the Residual Heat Removal (RHR) System to remove heat from the reactor system so that the refueling and nuclear system servicing can be performed.

14.2.12.3.37.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.37.3 Description

During the first suitable reactor cooldown, the shutdown cooling mode of the RHR system will be demonstrated. Unfortunately, the decay heat load is insignificant during the startup test period. Use of this mode with low core exposure could result in exceeding the 100°F/hr cooldown rate of the vessel if both RHR heat exchangers are used simultaneously, therefore, the demonstration is limited by the cooldown rate.

14.2.12.3.37.4 Criteria

Level 1

The transient response of any system-related variable to any test input must not diverge.

Level 2

The RHR system shall be capable of operating in the suppression pool cooling and shutdown cooling modes (with both one and two heat exchangers). System-related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25.

14.2.12.3.38 Test Number 72 - Drywell Atmosphere Cooling System

14.2.12.3.38.1 Purpose

The purpose of this test is to verify the ability of the Drywell Atmosphere Cooling System to maintain design conditions in the drywell during operating conditions and post scram conditions.

14.2.12.3.38.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.38.3 Description

During heatup and power operation, data will be taken to ascertain that the drywell atmospheric conditions are within design limits.

14.2.12.3.38.4 Criteria

Level 1

Not Applicable

Level 2

The drywell cooling system shall maintain drywell air temperatures and humidity at or below the design values as specified for the NSSS equipment.

14.2.12.3.39 Test Number 73 - Cooling Water Systems

14.2.12.3.39.1 Purpose

The purpose of this test is to verify that the heat removal performance of the standby service water (SW) system, the reactor building closed cooling water (RCCW) system, and the turbine building service water (TSW) system is adequate.

14.2.12.3.39.2 Prerequisites

The preoperational tests have been completed, the POC has reviewed and the plant manager has approved the test procedures and initiation of testing. Instrumentation has been checked or calibrated as appropriate.

14.2.12.3.39.3 Description

The SW, the RCCW, and the TSW systems' heat exchanger heat transport capabilities will be verified. Verification will be conducted in the following manner. The system water flow rate through each heat exchanger will be measured. The system water temperature drop across each heat exchanger will also be measured. From these acquired water flow rates and temperature drop data, the heat transport rates will be calculated. Where available, the calculated heat transport data will be compared directly with design calculations to determine acceptability. For those systems in which no design calculations of the heat transport rate have been directly calculated, the heat removal performance of the particular heat exchanger will be considered acceptable if the components serviced by the cooling system exhibit proper operation. If proper performance is not experienced, adjustments in the heat transport capability (i.e., increased flow to the heat exchanger or increased flow to a particular load) would be made. In addition to the heat exchanger heat transport rate verification, the actual SW pump head will be determined for all three SW pumps. This actual SW pump head will be compared to the design requirements for acceptability.

14.2.12.3.39.4 Criteria

<u>Level 1</u>

Not applicable.

Level 2

The system heat transport parameters either meet the requirements of the design specifications, or provide adequate cooling to the components serviced such that they operate satisfactorily.

BLANK

14.2.12.3.40 Test Number 74 - Off-gas System

14.2.12.3.40.1 Purpose

The purposes of this test are to verify the proper operation of the Offgas System over its expected operating parameters and to determine the performance of the activated carbon adsorbers.

14.2.12.3.40.2 Prerequisites

The Preoperational Tests have been completed, the POC has reviewed and the Plant Manager has approved the test procedures and initiation of of testing. Instrumentation has been checked or calibrated as appropriate. The Carbon Adsorber Vault Refrigeration System is available to the extent necessary to conduct the test.

14.2.12.3.40.3 Description

The pressure, temperature, relative humidity, system flow, and percentage of radiolytic hydrogen in the off-gas are periodically monitored during startup and at steady-state conditions. Prior to initial steam flow to the main condenser, charcoal bed hold-up times will be measured experimentally using a pulsed Kr-85 gas injection technique. The charcoal bed dynamic absorption coefficient will then be determined by established analytical methods. The performance of the catalytic recombiner will be compared with the Catalytic Recombiner Guaranteed Performance Curve.

14.2.12.3.40.4 Criteria

Level 1

The release of radioactive gaseous and particulate effluents must not exceed the limits specified in the site technical specifications. There shall be no loss of flow of dilution steam to the noncondensing stage when the steam jet air ejectors are pumping.

Level 2

The system flow, pressure, temperature, and relative humidity shall comply with design specifications. The catalytic recombiner, the hydrogen analyzer, the activated carbon beds, and the filters shall be performing their required function.

TABLE 14.2-1

PREOPERATIONAL TESTS

Subsection Reference	Test Title
14.2.12.1.1	Reactor Feedwater System Preoperational Test
14.2.12.1.2	Condensate System Preoperational Test
14.2.12.1.3	Fire Protection System Preoperational Test
14.2.12.1.4	Reactor Water Cleanup System Preoperational Test
14.2.12.1.5	Standby Liquid Control System Preoperational Test
14.2.12.1.6	Nuclear Boiler System Preoperational Test
14.2.12.1.7	Residual Heat Removal System Preoperational Test
14.2.12.1.8	Reactor Core Isolation Cooling System Preoperational Test
14.2.12.1.9	Reactor Recirculation System and Control Preoperational Test
14.2.12.1.10	Reactor Manual Control System Preoperational Test
14.2.12.1.11	Control Rod Drive Hydraulic System Preoperational Test
14.2.12.1.12	Fuel Handling and Vessel Servicing Equipment Preoperational Test
14.2.12.1.13	Low Pressure Core Spray System Preoperational Test

TABLE 14.2-1 (Continued)

Subsection Reference	Test Title
14.2.12.1.14	High Pressure Core Spray Preoperational Test
14.2.12.1.15	Fuel Pool Cooling and Cleanup System Preoperational Test
14.2.12.1.16	Leak Detection System Preoperational Test
14.2.12.1.17	Liquid and Solid Radwaste System Preoperational Test
14.2.12.1.18	Reactor Protection System Preoperational Test
14.2.12.1.19	Neutron Monitoring System Preoperational Test
14.2.12.1.20	Traversing In-Core Probe System Preoperational Test
14.2.12.1.21	Rod Worth Minimizer System Preoperational Test
14.2.12.1.22	Process Radiation Monitoring System Preoperational Test
14.2.12.1.23	Area Radiation Monitoring System Preoperational Test
14.2.12.1.24	Process Computer Interface System Preoperational Test
14.2.12.1.25	Rod Sequence Control System (RSCS) Preoperational Test
14.2.12.1.26	Remote Shutdown Preoperational Test

TABLE 14.2-1 (Continued)

Subsection Reference	Test Title
14.2.12.1.27	Offgas System Preoperational Test
14.2.12.1.28	Environs Radiation Monitoring System Preoperational Test
14.2.12.1.29	Main Steam System
14.2.12.1.30	Radwaste Building HVAC System Preoperational Test
14.2.12.1.31	Closed Cooling Water System Preoperational Test
14.1.12.1.32	Primary Containment Atmospheric Control System
14.2.12.1.33	Primary Containment Cooling System
14.2.12.1.34	Primary Containment Instrument Air System
14.2.12.1.35	Primary Containment Atmospheric Monitoring System
14.2.12.1.36	Standby Gas Treatment System
14.2.12.1.37	Loss of Power and Safety Testing
14.2.12.1.38	Deleted
14.2.12.1.39	Deleted
14.2.12.1.40	Deleted
14.2.12.1.41	Instrument Power System
14.2.12.1.42	Emergency Lighting
14.2.12.1.43	Standby AC Power System

TABLE 14.2-1 (Continued)

Subsection Reference	Test Title
14.2.12.1.44	250 Vdc Distribution System
14.2.12.1.45	125 Vdc Distribution System
14.2.12.1.46	24 Vdc Distribution System
14.2.12.1.47	Plant Service Water System
14.2.12.1.48	Standby Service Water System
14.2.12.1.49	Plant Communication System
14.2.12.1.50	Reactor Building Emergency Cooling System
14.2.12.1.51	Control Cable and Critical Switchgear Rooms HVAC System
14.2.12.1.52	Standby Service Water pumphouse H&V System
14.2.12.1.53	Reactor Building Crane
14.2.12.1.54	Primary Containment integrated leakrate test
14.2.12.1.55	Secondary Containment integrated leakrate test
14.2.12.1.56	Diesel Generator Building H&V System Preoperational Test

TABLE 14.2-2

MAJOR PLANT TRANSIENTS

		TEST CONDITION		
	APPROXIMATE POWER (% Rated)	20-25	60-75	95-100
	APPROXIMATE CORE FLOW (% Rated)	37	100	100
TEST NO.	TEST TITLE			
23	Feedwater Pump Trip			X
23	Loss of Feedwater Heating			X
25	MSIVs (All valves, Full Isolation)			X
27	T-G Stop Valve Fast Close		X	
27	T-G Control Valve Fast Close	X		X
28	Shutdown from Outside Control Room	X		
30	Recirc. Pump Trips		X	X
31	Loss of Gen. & Offsite Power	X		
	Test Condition	1,2	3	6

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TABLE 14.2-3

STABILLITY TESTS

TEST CONDITION

TEST NO.	TEST TITLE	APPROXIMATE POWER (% Rated) 20 / APPROXIMATE CORE FLOW (% Rated) 37	40 / 50	60-75 / 100	60-75 / 55	95-100 / 100	40-50 / NC
21	Core Power - Void Mode Response		X		X		X
22	Press. Reg. Setpoint Changes	X	X	X	X	X	X
22	Press. Reg. Backup Regulator	X	X	X	X	X	X
23	FW System: Water Level Setpoint Change		X	X	X	X	X
23	FW System: Heater Loss					X	
24	Turbine Valve Surveillance				X		
29	Recirculation Flow Control System	X	X	X	X	X	
	Test Condition	1	2	3	5	6	4

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TABLE 14.2-4

STARTUP TEST PROGRAM

STI No.	TEST NAME	COLD TEST OR OPEN RPV	HEAT UP	TEST CONDITIONS[1] 1	2	3	4	5	6	WARRANTY
1	Chemical & Radiochemical	X	X	X		X		X	X	
2	Radiation Measurements	X	X	X		X			X	
3	Fuel Loading	X								
4	Full Core Shutdown Margin	X								
5	CRD	X	X		X[2]	X[2]			X[2]	
6	SRM Perf. & Control Rod Seq.	X	X	X						
7	Not Applicable									
8	Not Applicable									
9	Water Level Reference Leg Temp. Measurements		X							
10	IRM Performance	X	X	X						
11	LPRM Calibration		X	X		X			X	
12	APRM Calibration		X	X	X	X		X	X	X
13	Process Computer	X	X	X[3]					X	
14	RCICS		X	X						
15	Not Applicable									
16	Selected Process Temperatures		X			X	X			

TABLE 14.2-4 (Continued)

STI No.	TEST NAME	COLD TEST OR OPEN RPV	HEAT UP	TEST CONDITIONS[1] 1	2	3	4	5	6	WARRANTY
17	System Expansion	X	X	X		X			X	
18	Core Power Distribution					X			X	
19	Core Performance			X	X	X	X	X	X	X
20	Electrical Output and Heat Rate									X
21	Core Power-Void Mode Response				X		X	X		
22	Pressure Regulator: Setpoint Changes			X,BP	X,BP	X,no M,BP	X,BP	X,BP,M	X,M,BP	
	Backup Regulator			X,BP	X,BP	X,no M,BP	X,BP	X,no BP,M	X,M,BP	
23	FW System: FW Pump Trip								M[14]	
	Water Level Setpoint Change				X	X,M	X	X	X,M	
	Heat Loss								X[12]	
	Maximum Runout Capability							X	X	
24	Turbine Valve Surveillance				X[4]			X[5],SP	X[7,8],SP	
25	MSIVs: Each Valve		X	X[3],S						
	One Valve				X[4],SP			X[5,8,7],SP		
	Full Isolation								X[2,10,13],SC	
26	Relief Valves: Flow Demonstration				X[4,13]					
	Operational		X		X[4]					

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TABLE 14.2-4 (Continued)

STI No.	TEST NAME	COLD TEST OR OPEN RPV	HEAT UP	TEST CONDITIONS[1] 1	2	3	4	5	6	WARRANTY
27	Turbine Stop Valve Trip					$X^{2,13}$,SD				
	Generator Load Rejection				X,BP				$X^{2,13,15}$,SD	
28	Shutdown From Outside C Room			X						
29	Recirculation Flow Control System		L	L	M^4,X^4 L^4,A^4	$X^{4,14}$ L^4,M^4 A^4		M^5,A^5,X^5 L^5		
30	Recirc. System: Trip One Pump					$X^{13,15}$			$X^{13,15}$	
	Trip Two Pumps					$X^{13,15}$				
	System Performance				$X^{4,13}$, X^{15}	$X^{5,13,15}$	X		X^{13}	
	Non-Cavit. Verif.					X				
31	Loss of T-G Offsite Power				$X^{2,13}$, SD					
32	Not Applicable									
33	Piping Vibration				X	X		X	X	
34	RPV Internals Vibration				X^4	X^4		X^5	X^5	
35	Recirc. System Flow Calibration					X			X	
36-69	Not Applicable									
70	Reactor Water Cleanup System		X							
71	Residual Heat Removal System		X	X					X	

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TABLE 14.2-4 (Continued)

STI No.	TEST NAME	COLD TEST OR OPEN RPV	HEAT UP	TEST CONDITIONS[1] 1	2	3	4	5	6	WARRANTY
72	Drywell Atmosphere Cooling		X		X				X	
73	Cooling Water System		X						X	
74	Off Gas System	X	X		X	X		X	X	

1 See Figure 14.2-3 for Test Conditions region map.

2 Perform Test 5, timing of 4 slowest control rods in conjunction with these scrams.

L = Local Position Command Mode Operation, POS

M = Flux Command Mode Operation, FLX

X = Combined Flow Command Mode Operation, FLO

BLANK

TABLE 14.2-4 (Continued)

STARTUP TEST PROGRAM

3 Between Test Conditions 1 and 3

4 Between Test Conditions 2 and 3

5 Between Test Conditions 5 and 6

6 DELETED

7 Future maximum power test point

8 Determine maximum power without scram

9 DELETED

10 DELETED

11 DELETED

12 80 - 90 % Power.

13 Do STI 33 in conjunction with this test.

14 Demonstrate Recirculation System Runback Feature.

15 Perform STI 34 in conjunction with this Test.

A = Automatic Load Following Mode Operation, ALF

SP = Scram Possibility

SD = Scram Definite

BP = Bypass Valve Response

* = Do either Stop Valve or Control Valve Trip

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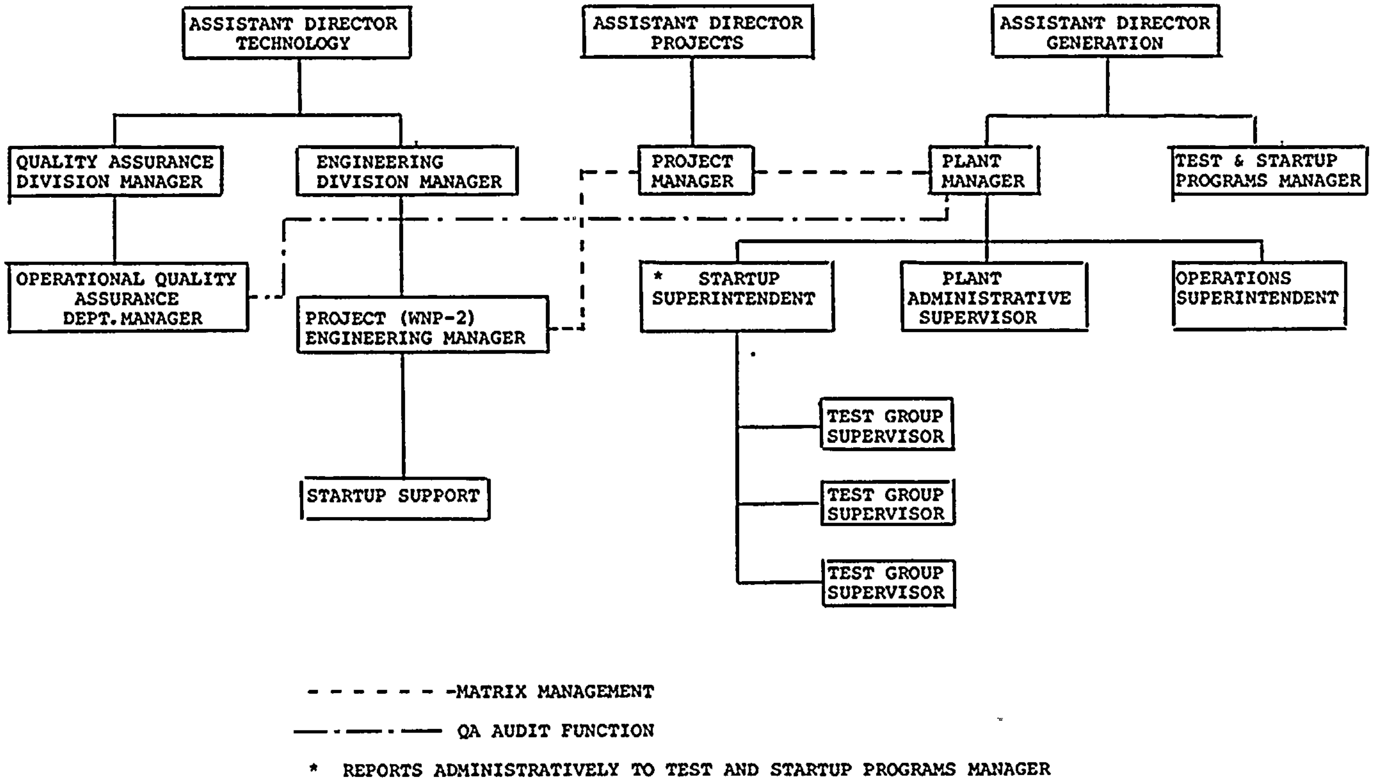
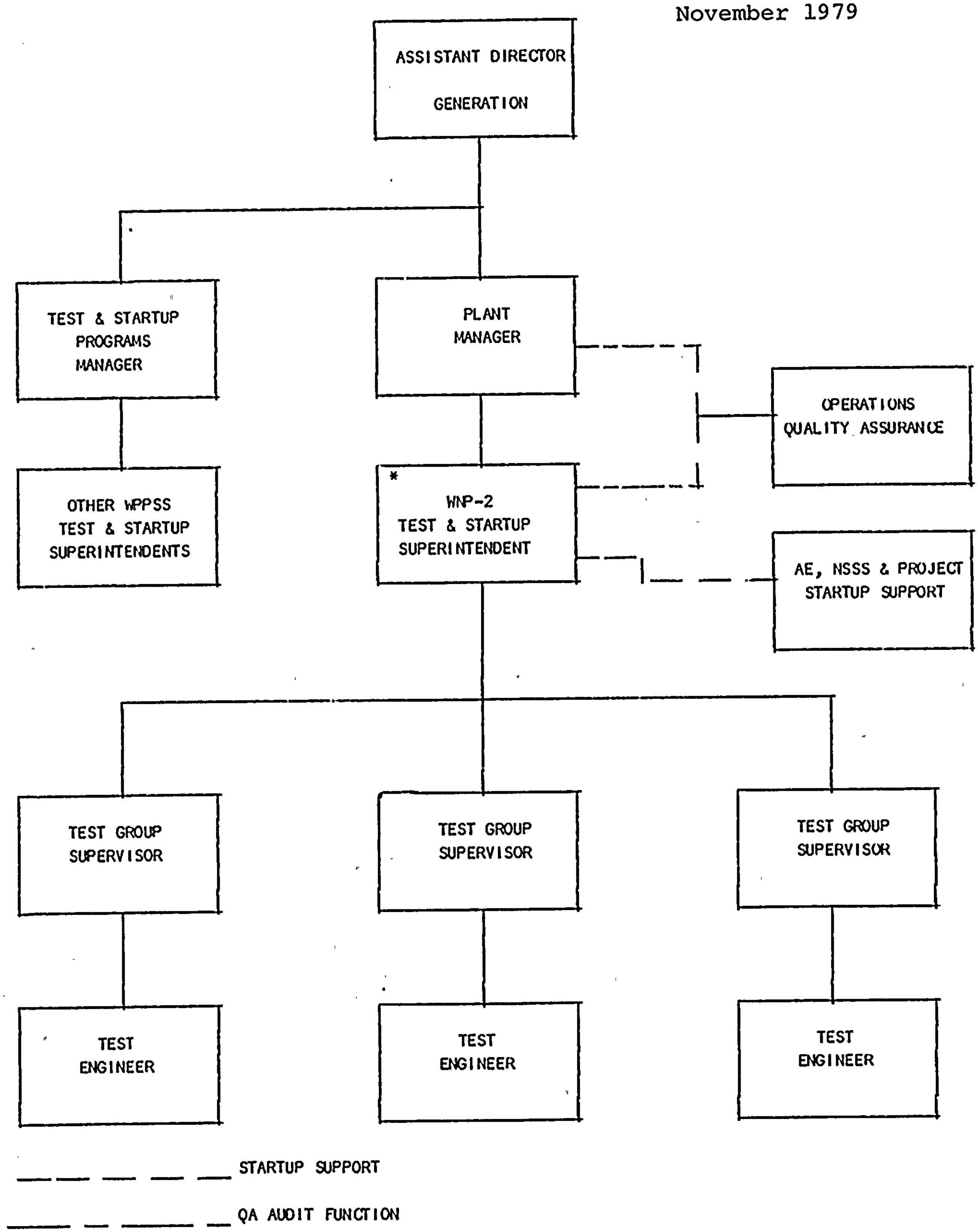
NOVEMBER, 1979

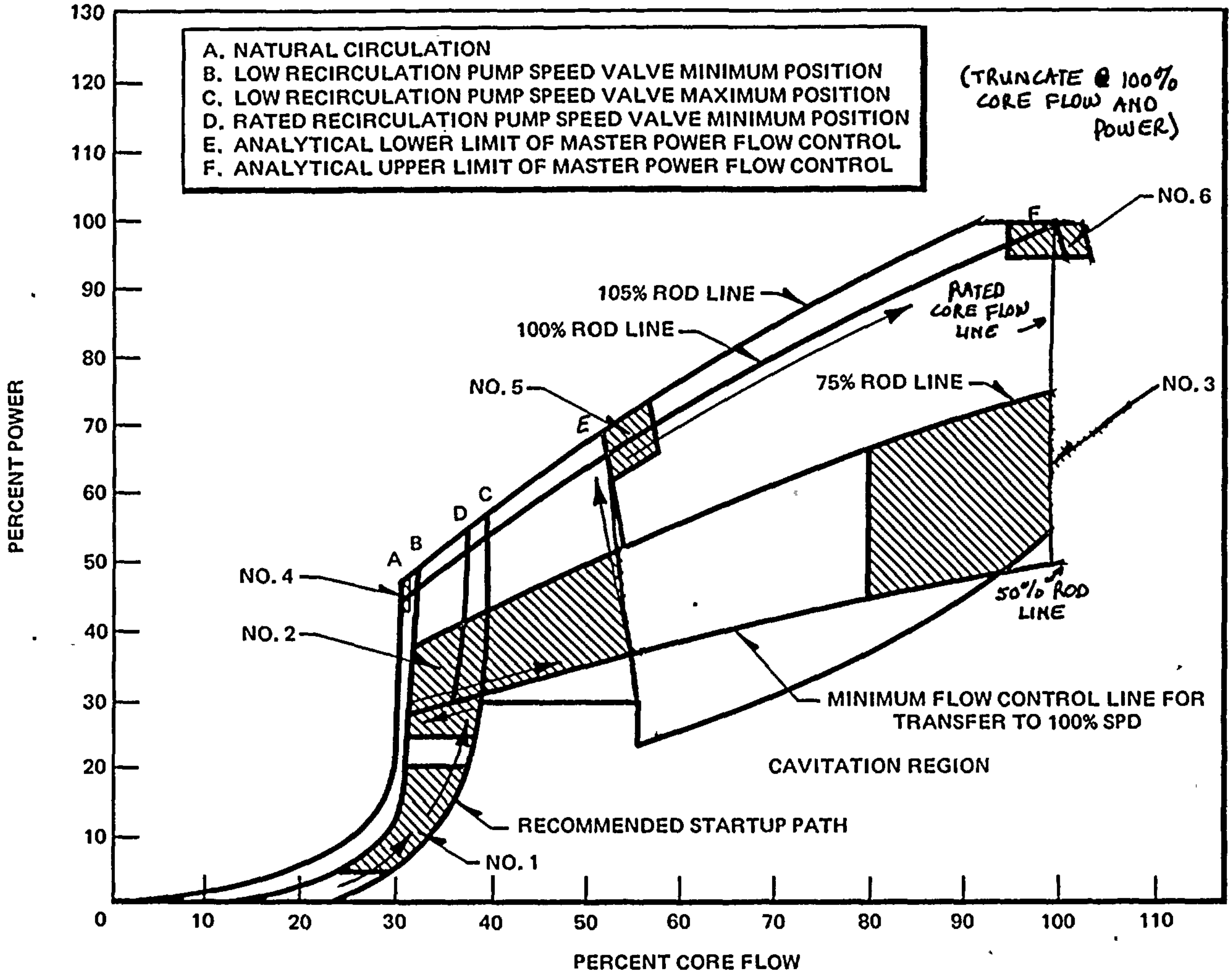


WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	TEST AND STARTUP RELATION TO OTHER WPPSS DEPARTMENTS	FIGURE 14.2-1



* REPORTS ADMINISTRATIVELY TO TEST AND STARTUP PROGRAMS MANAGER

WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	TEST AND STARTUP ORGANIZATION	FIGURE 14.2-2



CONDITION (TC)	
1	BEFORE MAIN GENERATOR SYNCHRONIZATION AND RECIRC PUMPS OPERATING ON LOW FREQUENCY POWER SUPPLY FROM APPROXIMATELY 5 to 20 PERCENT THERMAL PWR
2	BETWEEN 50% AND 75% CONTROL ROD LINES, AT OR BELOW THE ANALYTICAL LOWER LIMIT OF MASTER FLOW CONTROL MODE
3	FROM 50% TO 75% CONTROL ROD LINES AND CORE FLOW BETWEEN 80% AND MAXIMUM ALLOWABLE
4	NATURAL CIRCULATION AND WITHIN 5% OF THE INTERSECTION WITH 100% ROD LINE
5	MID-POWER RANGE WITHIN 5% OF 100% CONTROL ROD LINE AND 0 TO +5% CORE FLOW OF THE MINIMUM FLOW LINE, FOR MASTER FLOW CONTROL IN MANUAL MODE, AND FOR AUTOMATIC POWER CONTROL IN AUTO MODE
6	WITHIN 0 TO −5% OF RATED THERMAL POWER, AND WITHIN 5% OF RATED CORE FLOW RATE

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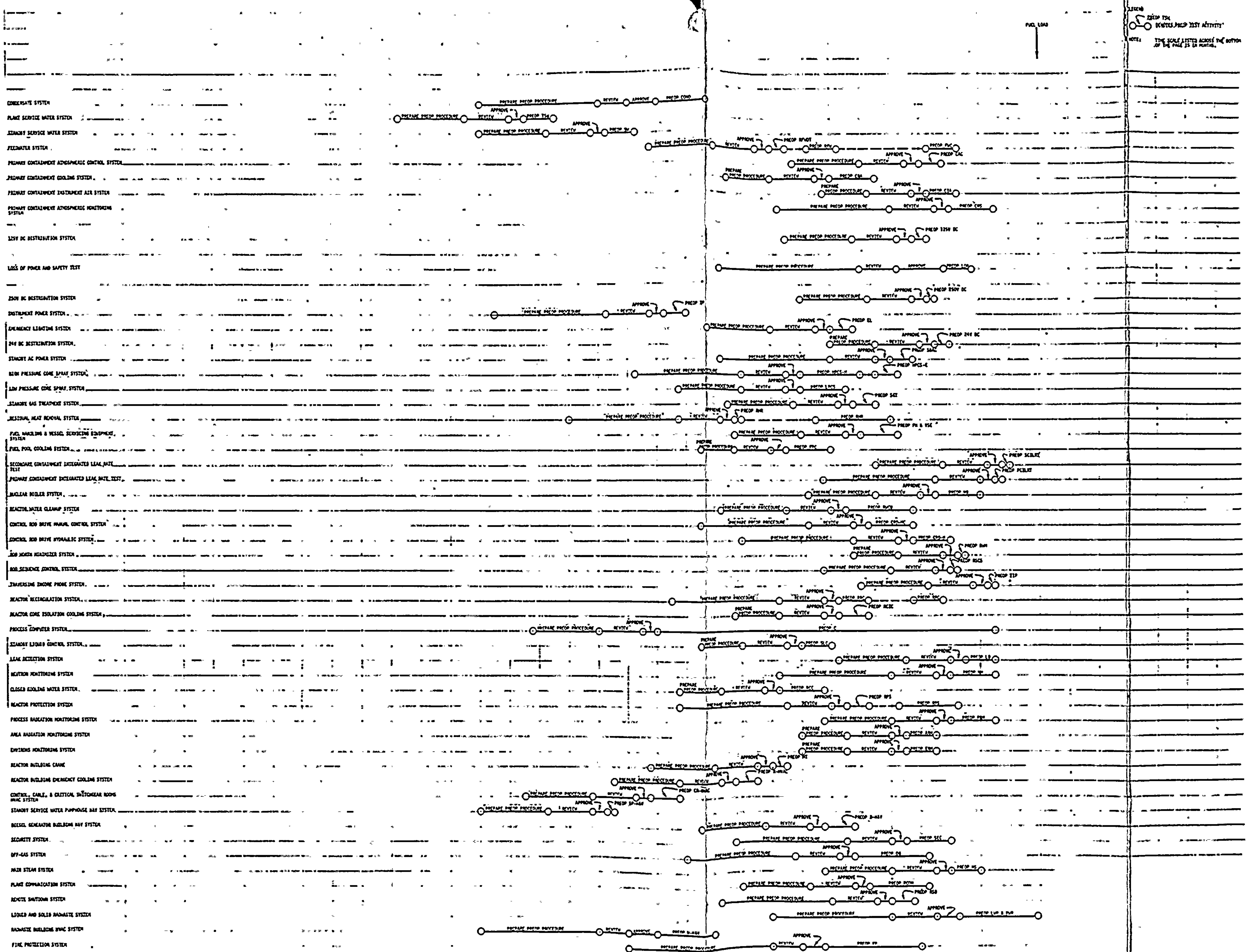
November 1981



WASHINGTON PUBLIC POWER SUPPLY SYSTEM
NUCLEAR PROJECT NO. 2

PREOPERATIONAL TEST SCHEDULE

FIGURE 14.2-4

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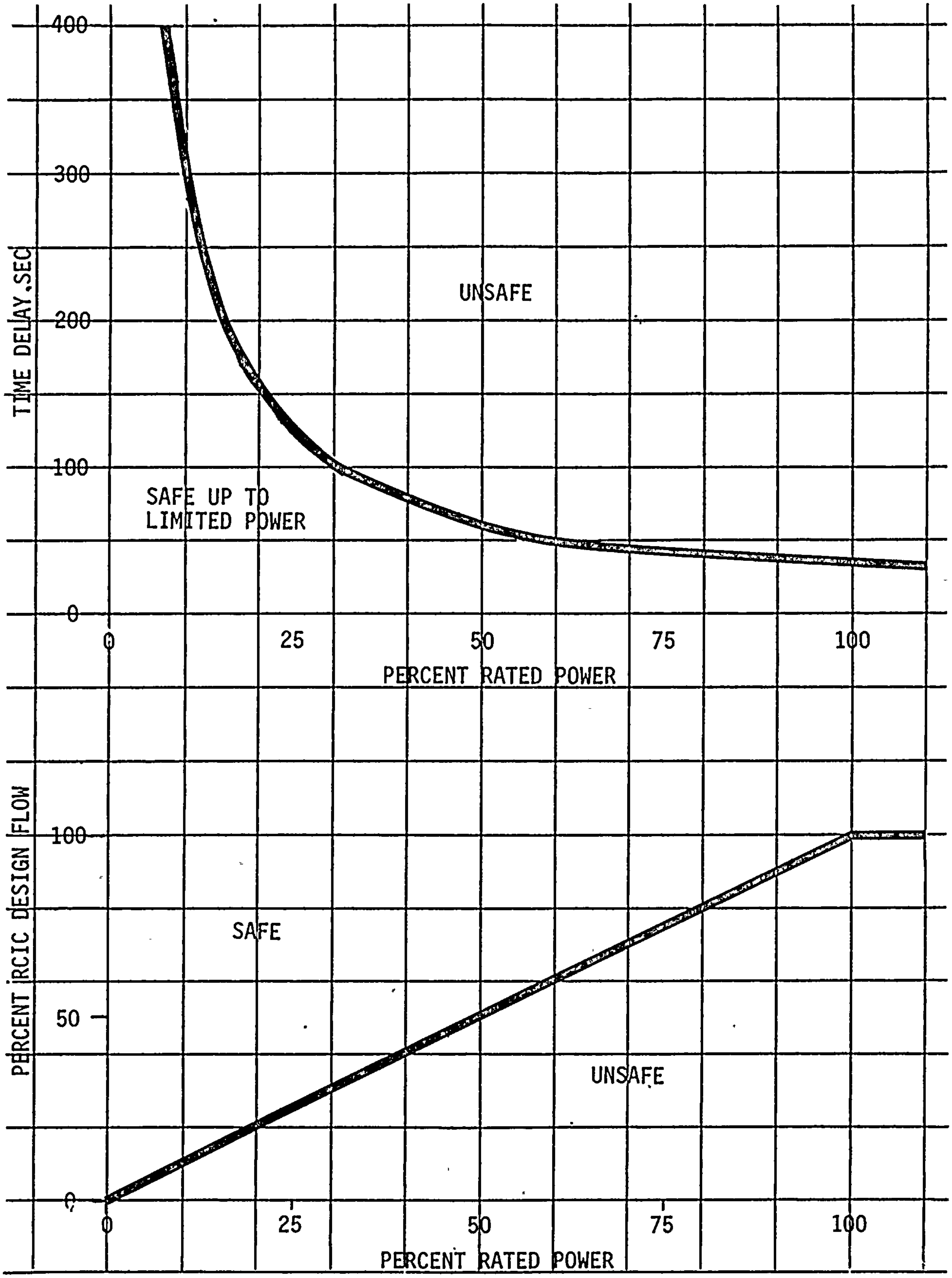
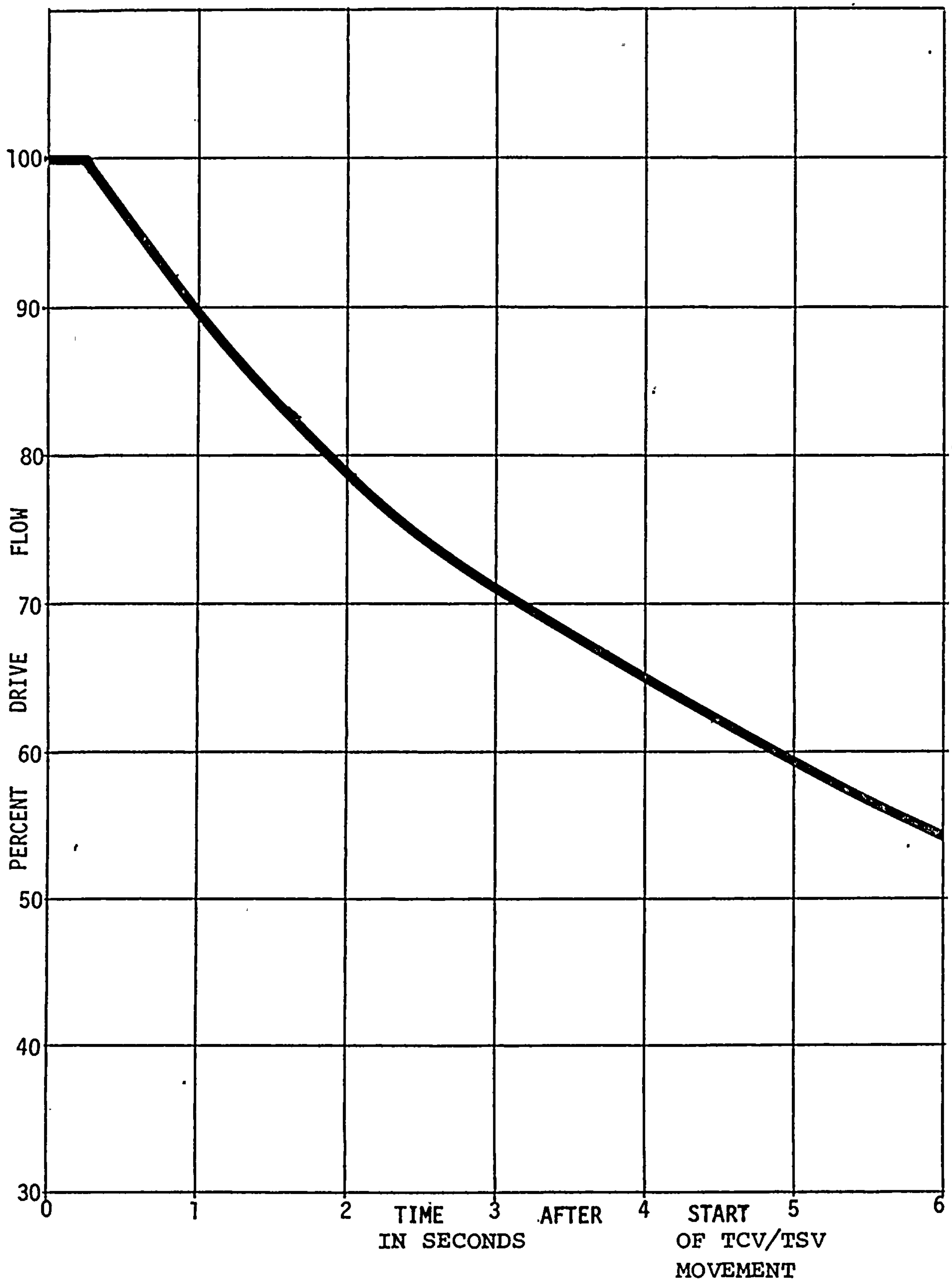


WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	RCIC ACCEPTANCE CRITERIA CURVES FOR CAPACITY AND ACTUATION TIME	FIGURE 14.2-5

AMENDMENT NO. 20
November 1981



WASHINGTON PUBLIC POWER SUPPLY SYSTEM NUCLEAR PROJECT NO. 2	MAXIMUM ACCEPTABLE DRIVE FLOW RESPONSE	FIGURE 14.2-6

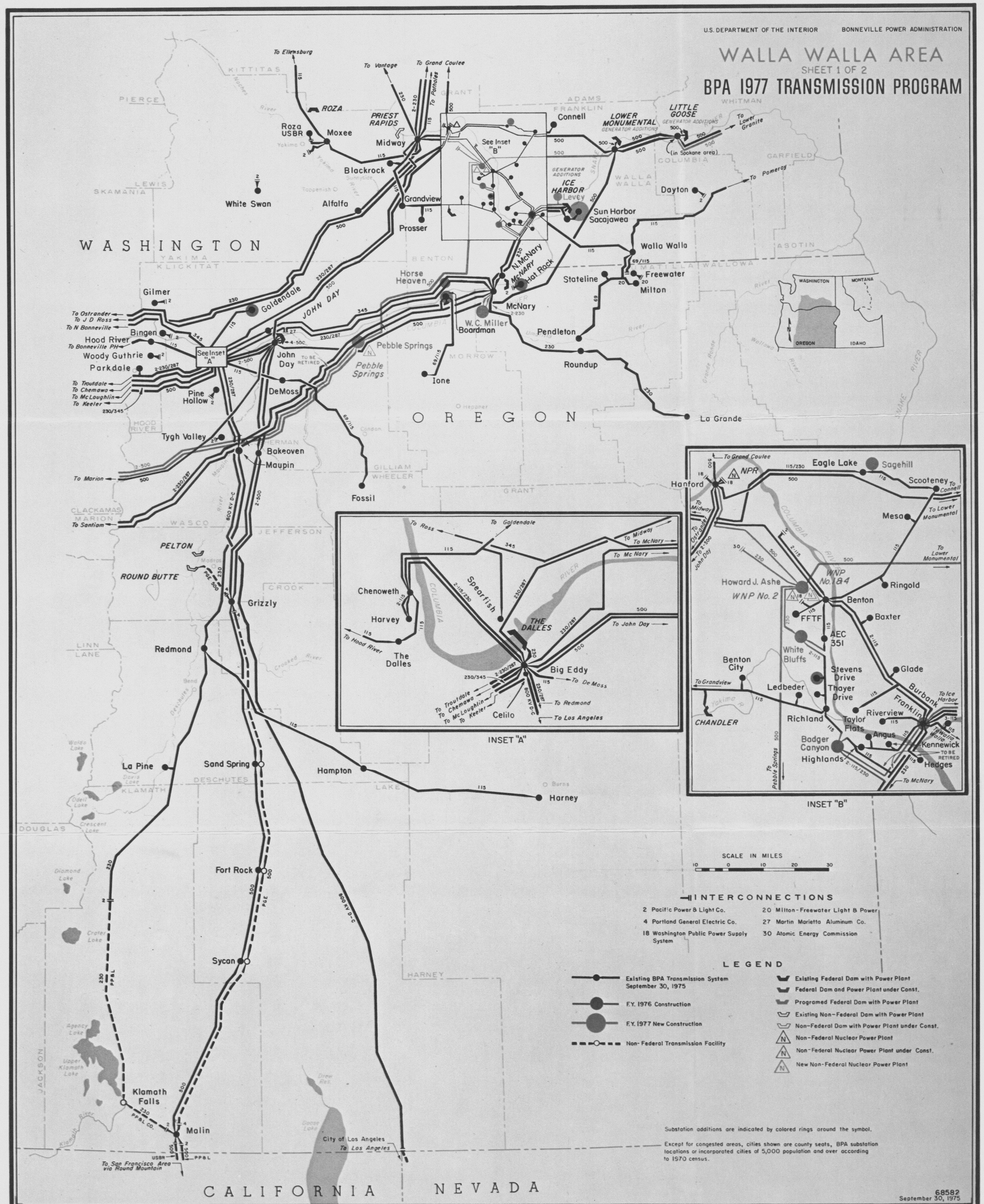


FIGURE 8.1-2

FIGURE 8.1-2

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