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June 13, 1983

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

Subject: Limerick Generating Station, Units 1&2
Response to Procedures and Test Review Branch
Draft Safety Evaluation Report (DSER)

Reference: A. Schwencer to E. G. Bauer, Jr., letter dated March 11, 1983

File: GOVT 1-1 (NRC)

Dear Mr. Schwencer:

The attached documents are FSAR page changes to Procedures and Test Review Branch (PTRB), Draft Safety Evaluation Report (DSER), Section II, "Test Review", Item 2.

The draft FSAR page changes will be formally incorporated into the FSAR revision scheduled for July, 1983.

Sincerely,

Eugene J. Bradley

RJS/gra/13

Copy to: See Attached Service List

B001
1/1

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DRAFT

14.2.12 INDIVIDUAL TEST DESCRIPTIONS

Individual abstracts for each preoperational test conducted during the preoperational test program are presented in Table 14.2-4. Individual abstracts for each startup test conducted during the subsequent startup test program are presented in Table 14.2-3. These abstracts identify each test by title and number, describe the test objectives, identify the test prerequisites, provide a summary description of the test method, and establish basic test acceptance criteria. Presently known documents which provide sources of acceptance criteria are identified in parentheses in the acceptance criteria section of the individual abstracts. Other documents or FSAR Sections referenced within the identified document may also serve as sources of acceptance criteria. The test abstracts are not intended to be ongoing documents that are continuously changed as references are modified. The identification of documents may be modified as specific acceptance criteria are developed and test procedures are written.

TABLE 14.2-4

PREOPERATIONAL TEST PROCEDURE ABSTRACTS

(P-2.1) 125 V dc Safeguard Power System

Test Objective - The test objective is to demonstrate the ability of the 125 V dc safeguard power system to provide an uninterruptible source of power to the 125 V dc distribution panels.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Batteries are filled with electrolyte to normal level, and 440 V ac power is available to provide power to the battery chargers. The load resistor bank is available to support the battery load capacity test. Battery room ventilation is available and operational.

Test Method

Performance test - The battery charger is disconnected and a design constant current load is applied to the battery for an 8-hr period.

Service test - The battery charger is disconnected and critical period design current loads are applied to the battery for a 4-hr period.

Battery charger test - With the battery fully discharged, the battery charger is connected. The largest design steady-state load demand is applied to the battery for a 24-hr period.

Operate all dc loads with the battery at minimum terminal voltage. System alarms and tripping devices are actuated.

(FSAR Section 8.3.2)

Acceptance Criteria

a. The voltage of each battery cell is within specified limits.

b. Design dc loads will function.

c. The voltage of each battery cell is within specified limits.

d. The battery charger float charge is within specified limits.

e. The battery charges properly.

~~f. Design dc loads function.~~

(FSAR Section 8.3.2)

g. All dc loads operate properly.

h. System battery chargers supply system batteries and the normal system load.

i. System dc electrical power is available to all system distribution panels.

j. System alarms operate properly.

(P2.2) 125/250 V dc Safeguard Power System

Test Objective - The test objective is to demonstrate the ability of the 125/250 V dc safeguard power system to provide an uninterruptible source of power to the 125/250 V dc motor control centers and to various 125 V dc distribution panels.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Batteries are filled with electrolyte to normal level, and 440 V ac power is available to provide power to the battery chargers. The load resistor bank is available to support the battery load capacity test. Battery room ventilation is available and operational.

Test Method - The load capacity of the batteries without the battery chargers is measured. The battery chargers are placed in operation and their performance characteristics are determined. System alarms and tripping devices are actuated.

(FSAR Section 8.3.2)

Acceptance Criteria

a. Battery load capacity is acceptable.

b. System battery charges both charge system batteries and supply normal system load.

c. System dc electrical power is available to all system. distribution panels.

d. System alarms operate properly.

(P-3.1) 13.2 kV Unit Auxiliary Power System

Test Objective - The test objective is to demonstrate the capability of the 13.2 kV unit auxiliary power system to provide reliable electrical service to the 13.2 kV buses, which include feeder breakers for the 4 kV safeguard power system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Offsite power is available from both the 220 kV and the 500 kV substations. 125 V dc control power is available and operational.

Test Method - The 13.2 kV unit auxiliary buses are energized from both offsite power sources, and alarms and control devices are actuated.

Acceptance Criteria

(Vendor Technical Manual) (Electrical Schematic Diagrams)

a. System breakers operate properly.
b. System bus voltages meet acceptable values.
c. System auto transfer circuits operate properly.
d. Feeder breaker interlocks operate properly.
e. System alarms operate properly.

(P-4.1) 4 kV Safeguard Power System

Test Objective - The test objective is to demonstrate the capability of the 4 kV safeguard power system to provide reliable electrical service to the 4 kV buses.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The 13.2 kV power and 125 V dc control power are available and operational.

Test Method - The 4 kV buses are energized, and system alarms and control devices are actuated.

Acceptance Criteria

a. System breakers operate properly. (FSAR Section 8.3.1.1.2)

b. System bus voltages meet acceptable values. (FSAR Section 8.1.6.3)

c. System auto transfer circuits operate properly. (FSAR Section 8.3.1.1.2)

d. Feeder breaker interlocks operate properly.

e. System alarms operate properly.

(P-5.1) Safeguard 440 V Load Centers

Test Objective - The test objective is to demonstrate the capability of the 440 V system to provide reliable power to the 440 V load centers and motor control centers.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The 4 kV buses are available for energization of the 440 V load centers. The 125 V dc control power is available for operation of the 4 kV switchgear breakers.

Test Method - Breakers are operated to energize the 440 V load centers and motor control centers. System alarms and controls, both manual and automatic, are actuated.

Acceptance Criteria (FSAR Section 8.3.1.1.2)

a. System breakers operate properly.

b. System bus voltages meet acceptable voltages.

c. System alarms are operable.

(P-6.1) Safeguard 440 V Motor Control Centers

Test Objectives - The test objective is to demonstrate the capability of the 440 V motor control centers to provide reliable power to the motor control centers panels and loads.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The 440 V Class IE load centers are available for energization of the 440 V motor control centers. 125 V dc control power is available for operation of the switchgear breakers.

Test Method - Breakers are operated to energize the 440 V motor control centers. System alarms and controls, both manual and automatic, are actuated.

Acceptance Criteria (FSAR Section 8.3.1.1.2)

a. System breakers operate properly.

b. System bus voltages meet acceptable voltages.

c. System alarms operate properly.

(P-7.1) Standby DC Lighting System

Test Objective - The test objective is to demonstrate the ability of the 125 V dc standby lighting system to provide emergency lighting on loss of normal lighting power.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Offsite ac power and 125 V dc power are available.

Test Method - The standby dc lighting panels are energized from their normal ac supply. The normal power supply is interrupted, and 125 V power is verified as an emergency lighting power source. Adequate illumination exists for safe plant operation.

Acceptance Criteria (FSAR 9.5.3.2.2)

a. System breakers operate properly.

b. System supply voltages are within specified limits.

c. System auto-transfer devices operate properly.

d. Adequate illumination exists for safe plant operation.

(P-13.1) Fire Protection Water System

Test Objectives - The test objective is to demonstrate that the fire protection water system operates as designed, to supply fire water to required areas.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Sufficient water is available in the cooling tower basins to conduct the test.

Test Method - The fire protection water system is placed in operation, and performance data are obtained for the diesel and electric fire pumps. System controls and alarms are actuated, including auto and manual initiation of system sprinklers. The transformer deluge is activated and the system hose reel and hydrants are operated.

Acceptance Criteria (FSAR Section 9.5.1)

a. System pumps meet acceptable head and flow values.
b. System automatic and manual initiation are operable.
c. System sprinklers are operable.
d. System hydrants and hose reels are operable.
e. System deluge patterns are acceptable.

(P-13.2) Fire Protection Carbon Dioxide System

Test Objectives - The test objective is to demonstrate the capability of the fire protection carbon dioxide system to initiate CO_2 release to designated areas, as designed.

Prerequisites - To the extent necessary to perform this test, construction is completed and instrumentation and controls are operable and calibrated. Sufficient CO_2 is available for the required discharge tests.

Test Method - Automatic and manual initiations of CO_2 discharge are simulated. Operation of dampers by CO_2 is verified.

Acceptance Criteria (FSAR Section 9.5.1)

a. System automatic and manual initiation are operable.
b. Damper operation is proper.
c. System alarms operate properly.

(P-13.3) Fire Protection Air Foam System

Test Objective - The test objective is to demonstrate that foam can be delivered as designed.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The fire protection water system is operable and capable of supplying sufficient water to the foam eductor.

Test Method - The air foam system is manually initiated, and foam is produced.

Acceptance Criteria

(FSAR Section 9.5.1.2.5)

a. System manual initiation operates properly.

b. System foam production is acceptable.

(P-13.4) Smoke Detection System

Test Objectives - The test objective is to demonstrate the proper operation of the smoke detection system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Smoke, fire, and trouble conditions are simulated, and system local and remote alarms and indication are verified.

Acceptance Criteria

(FSAR Section 9.5.1.2.9 & FPER Section 2.11)

a. System detectors operate properly.

b. System alarms and indicators operate properly.

(P-13.5) Fire Protection Halon System

Test Objective - The test objective is to demonstrate the capability of the fire protection halon system to initiate a release of Halon to all floor sections, as designed.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Sufficient Halon is available for the required discharge tests.

Test Method - Smoke and heat detectors are activated, and automatic initiation is simulated. System is manually initiated, and proper Halon distribution is verified. Trouble conditions are simulated, and proper alarm annunciation is verified.

(FSAR section 9.5.1.2.7)

Acceptance Criteria

a. Smoke detectors actuate early warning alarms.

b. Heat detectors actuate predischarge alarms followed by automatic discharge after a time delay.

c. System automatic and manual initiation are operable.

d. Halon distribution to all floor sections is within specified limits.

e. System alarms operate properly.

(P-14.1) Reactor Enclosure Cooling Water System

Test Objective - The test objective is to demonstrate that the reactor enclosure cooling water system functions as designed.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The service water system is available to provide cooling water for the system.

Test Method - The reactor enclosure cooling water system is placed in operation, and pump performance data are obtained. System controls and alarms are actuated.

(FSAR section 9.2.8.2)

Acceptance Criteria

a. System pumps meet acceptable head and flow values.

b. System head tank level controls maintain tank level properly.

c. System pump auto-start features are operable.

d. The reactor recirculation pump seal and motor oil cooler isolation valves and their logic circuits operate properly. (FSAR Section 9.2.8.2)

e. Flow is verified to each system component.

f. System alarms operate properly. (FSAR Section 9.2.8.5)

(P-16.1) Residual Heat Removal Service Water (RHRSW) System

Test Objective - The test objective is to demonstrate that under normal and emergency conditions, the RHRSW system supplies cooling water as designed.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Required portions of the cooling tower are operable, and the spray pond has water to operate the RHRSW pumps. The RHR heat exchangers are installed to provide a flow path for the pumps. The ESW system is available to support the flow verification test, as applicable.

Test Method - The RHRSW pumps and their controls are operated, and flow is measured for normal system operation modes. System automatic valve alignment is initiated for high radiation and ESW pump start. The high-radiation pump trip and the manual override operations are conducted. The spray networks are visually inspected for evenly distributed flow. System alarms are also actuated.

Acceptance Criteria (FSAR Section 9.2.3.2)

a. System pumps meet acceptable head and flow values for different system modes of operation.

b. System pumps in the standby mode auto-start properly.

c. System logic circuits operate properly.

d. System is operable from both the control room and the remote shutdown panel. Remote shutdown panel instrumentation operates properly.

e. RHRSW crossties to the cooling towers and to the ESW system pump circuits operate properly.

f. System alarms operate properly. (FSAR Section 9.2.3.5)

g. All keylocks and automatic features operate properly. (FSAR Section 9.2.3.2)

(P-17.1) Instrumentation AC Power System

Test Objectives - The test objective is to demonstrate the capability of the instrumentation ac power system to supply electrical power to the 120 V ac instrument panels.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The 440 V ac power is available for energization of the instrumentation ac panels.

Test Method - Breakers are operated to energize the instrument ac panels, and system alarms and control devices are actuated.

Acceptance Criteria

a. System 440 V ac breakers operate properly. (Vendor Technical Manual)

b. System bus voltages are acceptable. (FSAR Section 8.3.1.1.2)

c. System ac electrical power is available to all system distribution panels and instrument panels. (Electrical Schematic Diagram) (Single Line)

(P-18.1) Instrument Air System

Test Objectives - The test objectives are to demonstrate the capability of the instrument air system to provide dry compressed air at the rated capacity.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Air dryer chambers are filled with desiccant, and turbine enclosure cooling water is available.

Test Method - The system is placed in operation both automatically and manually, and performance data are obtained. Proper air distribution is verified. System control devices and alarms are actuated.

(FSAR Section 9.3.1.1.2)

Acceptance Criteria

a. System compressors discharge pressure, temperature, and capacity are within specified limits.

b. Compressor trips, interlocks, and automatic start logic are operable.

c. Air dryer cycles are proper, and air moisture content is maintained within specified limits.

d. System supplies air to each major distribution area.

e. System alarms operate. (FSAR Section 9.3.1.1.5)

(P-23.1) Diesel Generator Fuel Oil System

Test Objective - The test objective is to demonstrate that the diesel generator fuel oil system is capable of supplying fuel oil to the standby diesel generator day tanks.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are available and operational. Adequate fuel oil is present in the diesel oil storage tanks.

Test Method - The diesel oil transfer pumps are operated, and performance data are measured. System alarms and control devices are also actuated.

(FSAR Section 9.5.4.2)

Acceptance Criteria

a. System pumps meet acceptable delivery capability.

b. Automatic operation of the diesel oil transfer pumps is proper.

c. Each diesel oil transfer pump is capable of supplying any of the four diesel oil day tanks.

d. System alarms operate properly. (FSAR Section 9.5.4.5)

(P-24.1) Standby Diesel Generator System

Test Objective - The test objective is to demonstrate the capability of the standby diesel generator system to provide reliable electric power to Class 1E buses.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Emergency service water, diesel generator enclosure HVAC, 125 V dc power, fuel oil, and fire protection are available for diesel generator operation. ESF systems are available for operation during accident response testing.

Test Method - The diesel generators are started both manually and automatically. Starting times and repetitive starting capability are determined. Diesel generator and auxiliary systems performance is measured. System protection alarms and controls are also actuated. System response to accident conditions is verified. Diesel generator synchronization to offset power and load transfer is verified.

Acceptance Criteria (FSAR Section 8.3.1.1.3)

a. Each diesel generator is automatically started on simulated automatic actuation signals, and reaches rated voltage and frequency within an acceptable time.

b. Electrical interlocks between the diesel generators and their associated 4 kV buses operate properly.

c. Each diesel generator is capable of being stopped and started manually from both local and remote locations.

d. Each diesel generator carries rated loads for specified time periods.

e. Each diesel generator air starting system, fuel oil system, oil lubrication system, and its air supply and exhaust systems operate properly. (FSAR Sections 9.5.6, 9.5.4, 9.5.7, and 9.5.8)

f. Each system breaker operates properly. (Vendor Technical Manual)

g. System alarms and logics operate properly. (FSAR Section 8.3.1.1.3)

h. Each diesel generator operates properly during automatic load shedding and loading sequence.

i. Load shedding of non-essential loads during accident conditions is verified. (FSAR Section 8.3.1.1.3)

j. Diesel generator synchronization and load transfer operate properly.

k. Each diesel generator operates properly at full load conditions, and temperatures are within specified limits.

(P-25.1) Primary Containment Instrument Gas System

Test Objective - The test objectives are to demonstrate the capability of the primary containment instrument gas system to provide compressed gas at proper temperature and moisture content for containment services, and to demonstrate system isolation following a primary containment isolation signal.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The service water system is available to provide the cooling water requirements of the system, as applicable.

Test Method - The system is placed in operation automatically and manually, and performance data are obtained. System controls and alarms are actuated, including operation of the systems containment isolation valves upon a simulated primary containment isolation signal. System valves are realigned to utilize the backup containment instrument gas supply from the plant instrument air system.

Acceptance Criteria

a. System compressors meet acceptable values of discharge pressure and capacity. (FSAR Section 9.3.1.1.3)

b. Compressor trips, interlocks, and start logic are operable.

c. System isolation valves operate properly. (FSAR Section 6.2.4)

d. System alarms operate properly. (FSAR Section 9.3.1.1.3.5)

e. Gas temperature and moisture content are maintained within specified limits. (FSAR Section 9.3.1.1.3)

f. Redundant system components fail independently.

(P-28.1) Diesel Generator Enclosure HVAC System

Test Objective - The test objective is to demonstrate the capability of the standby diesel generator enclosure HVAC system to provide air flow, and temperature control to support diesel-generator operation.

Prerequisites - To the extent necessary to perform this test, construction is completed and instrumentation and controls are operable and calibrated. Diesel generators are available for full load operation.

Test Method - The fans are started automatically and manually. System alarms are also actuated. System parameters are monitored and recorded while the diesel generators are operated at full load. Heat removal capability is determined.

Acceptance Criteria

a. Each diesel generator cell's unit heaters operate properly. (FSAR Section 9.4.6)

b. Each cell's exhaust fans operate properly.

c. Enclosure cell exhaust fan and damper operating logic, including auto start, auto stop, and standby operation, operates properly.

d. System alarms operate properly. (FSAR Section 9.4.6.5)

e. System heat removal capacity is within specified limits.

(P-28.2) Spray Pond Pump Structure HVAC System

Test Objective - The test objective is to demonstrate the capability of the spray pond pump structure HVAC system to provide air flow and to respond to simulated room temperature variations.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - The spray pond pump structure HVAC system is placed in service. Enclosure temperature variations are simulated and system response verified. System controls, logics, and alarms

are actuated. System parameters are monitored and recorded. Heat removal capacity is calculated.

Acceptance Criteria

(FSAR Section 9.4.7)

a. Each system unit heater operates properly.

b. Each system supply fan operates properly.

c. Supply fan and damper logic operates properly.

d. System alarms operate properly. (FSAR Section 9.4.7.5)

e. System heat removal capacity is within specified limits.

(P-30.1) Control Enclosure HVAC System

Test Objective - The test objective is to demonstrate the capability of the control enclosure HVAC system to provide air flow and temperature control in the structure.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Demineralized water and electric power are available to provide the water and power requirements of the system. North vent stack and battery room exhaust fans are available for system operation.

Test Method - Control structure temperature variations are simulated and system response verified. The auxiliary equipment enclosure is purged, and system alarms and control devices are actuated. System parameters are monitored and recorded for systems cooling ESF components. Heat removal capacity is calculated. For Unit 2 testing, only the emergency switchgear and battery compartment ventilation equipment is operated, as the remainder of the control structure H&V system includes equipment contained in Unit 1, or common to Units 1 and 2.

Acceptance Criteria

(FSAR Section 9.4.1)

a. System fans operate properly.

b. System unit heaters operate properly.

c. System auto-start features and fan interlocks operate properly.

d. System fan and damper logic operates properly. (FSAR Section 9.4.1.9)

e. System alarms operate properly.

f. Heat removal capacity of systems cooling ESF components are within specified limits. (FSAR Section 9.4.1)

(P-30.2) Control Enclosure Chilled Water System

Test Objective - The test objective is to demonstrate the ability of the control enclosure chilled water system to provide chilled water flow for cooling the air supply to the control room, the auxiliary equipment compartment, the emergency auxiliary switchgear and battery compartments, and the standby gas treatment area.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The demineralized water and ESW systems are available to provide the water requirement of the system.

Test Method - Chiller operation, chilled water circulation pump operation, and system alignment are initiated by automatic start and manual signals. Flow paths are verified. System alarms are also actuated.

Acceptance Criteria (FSAR Section 9.2.10.2)

a. System circulation pumps meet acceptable head and discharge values.

b. System water chillers operate properly.

c. Flow is verified to each system component.

d. System alarms operate properly. (FSAR Section 9.2.10.2)

(P-31.1) Computer System

Test Objective - The test objective is to demonstrate the proper operation of computer input/output logic.

Prerequisites - To the extent necessary for performance of this test, construction is completed, computer hardware is calibrated, and software is debugged.

Test Method - Computer inputs are simulated and output indicators, alarms, etc are verified.

(Vendor Test Specification)

Acceptance Criteria

a. Computer outputs are operable.

b. Computer peripheral hardware operate properly.

(P-32.1) Control Room HVAC System

Test Objective - The test objective is to demonstrate the capability of the control room HVAC system to provide air flow and to control temperature.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - The fans are placed in operation. Control room temperature variations are simulated and system response is verified. Control devices are actuated to automatically align the system and to maintain positive pressure within the control room. Room air leakage is measured and system alarms are also actuated.

Acceptance Criteria

(FSAR ~~Sections~~ Sections 9.4.1 and 6.4)

a. System fans operate properly.

b. System fan auto-start features and interlocks are operable.

c. System fan and damper logic operates properly.

d. System alarms operate properly.

e. Air leakage from control room does not exceed design.

f. Results of in-place filter testing are satisfactory.

(P-32.2) Control Room Isolation and Purge System

Test Objective - The test objective is to demonstrate the capability of the control room isolation and purge system to isolate the control room from radiation or chlorine entering through the control room ventilation system and to purge the control room of smoke.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The following systems are available for operation: the control room supply and return air system and the control room emergency fresh air supply system.

Test Method - High radiation and chlorine conditions are simulated to verify the automatic isolation of the control room. The control room purge system is actuated and system response verified. System alarms are actuated.

(FSAR Sections 9.4.1 and 6.4)

Acceptance Criteria

a. The control room is isolated and maintained at a positive pressure during a high radiation condition.

b. The control room emergency fresh air supply system automatically starts during a high radiation condition.

c. The control room is completely isolated during a high chlorine condition.

d. System purge mode operates properly.

e. System alarms operate properly.

(P-33.1) Turbine Enclosure HVAC System

Test Objectives - The test objective is to demonstrate the capability of the turbine enclosure HVAC system to provide air flow and temperature control in the structure.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The instrument air, drywell chilled water, and plant heating steam systems are available.

Test Method - The turbine enclosure HVAC system is placed in operation. Enclosure temperature variations are simulated, and system response is verified. System controls, logics, and alarms are actuated.

Acceptance Criteria (FSAR Section 9.4.4)

a. System fans operate properly.

b. System fan and damper logic operates properly.

c. System cooling coils and temperature control valves operate properly.

d. System heating coils and temperature control valves operate properly.

e. System filter units operate properly.

f. System alarms operate properly. (FSAR Section 9.4.4.5)

(P-34.1) Reactor Enclosure HVAC System

Test Objective - The test objective is to demonstrate the capability of the reactor enclosure HVAC system to provide normal air flow and recirculation mode air flow.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The turbine enclosure north and south vent stacks are available to support this test. The standby gas treatment system (SGTS) is operational.

Test Method - The fans are placed in operation. Control devices are actuated to isolate the reactor enclosure, and the system is operated in its recirculation mode. System alarms are also actuated. Containment nitrogen inerting flow paths and controls are tested.

Acceptance Criteria (FSAR Section 9.4.4.2)

a. System fans operate properly.

b. The recirculation system auto-starts upon receipt of a reactor enclosure isolation signal.

c. System fan standby features, interlocks, permissives, and auto-start circuits operate properly. (FSAR Section 9.4.2)

d. The reactor enclosure ventilation system is shutdown and isolated properly.

e. System unit heaters and coolers operate properly.

f. System steam flooding damper operation is proper.

g. System alarms operate properly. (FSAR Section 9.4.2.2.5)

h. Nitrogen inerting system operates properly.

i. Reactor enclosure isolation logic operates properly.

j. System filter units operate properly, and in-place filter efficiency test results are satisfactory. (FSAR Section 6.5.1.3)

(P-34.2) Refueling Area HVAC System

Test Objective - The test objective is to demonstrate the capability of the refueling area HVAC system, to provide normal air flow and fuel handling accident mode air flow.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The turbine enclosure north and south vent stacks are available to support this test. The standby gas treatment system (SGTS) is operational.

Test Method - The fans are placed in operation. Control devices are actuated to isolate the refueling area, and the system is operated in its fuel handling accident mode. System alarms are also actuated.

Acceptance Criteria (FSAR Section 9.4.2)

a. System fans operate properly.

b. System fan standby features, interlocks, permissives, and auto-start circuits operate properly.

c. The refueling area ventilation system is shutdown and isolated properly.

d. System unit heaters and coolers operate properly.

e. System alarms operate properly. (FSAR Section 9.4.2.2.5)

f. Refueling area isolation logic operates properly.

g. System filter units operate properly, and in-place filter efficiency test results are satisfactory. (FSAR Section 9.4.2)

(P-35.1) Fuel Pool Cooling/Cleanup System

Test Objective - The test objective is to demonstrate the operability of the fuel pool cooling and cleanup system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Makeup water from the demineralized water tank is available. The RHR system is capable of supplying water to system diffusers.

Test Method - System pumps are placed in operation and system flow paths are verified. System controls are verified. System filter cycles are verified.

Acceptance Criteria (FSAR Section 9.1.3)

a. System pumps meet acceptable head and flow values.

b. System controls operate properly.

c. Filter hold, precoat, and backwash controls operate properly.

d. Siphon breaker holes in the system return lines operate properly.

e. Fuel transfer canal gates prevent excessive water loss from the spent fuel pool when adjacent cavities are empty.

f. System alarms operate properly. (FSAR Section 9.1.3.5)

(P-37.1) Demineralized Water Transfer System

Test Objective - The test objectives are to demonstrate the ability of the demineralized water transfer system to transfer water to and from the condensate storage tanks and refueling water tanks to various systems.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Demineralized water, plant heating steam, and instrument air systems are operable.

Test Method - System is operated, and power operated valves are cycled both automatically and manually. Flow is directed through each flow path. Tank levels and temperatures are simulated, and control system operation is verified.

Acceptance Criteria (FSAR Section 9.2.7)

a. System pump's head and capacity are within specified limits.

b. Pump trips and control logic are operable.

c. Power operated valves operate properly.

d. Condensate and refueling water temperature controls operate properly.

e. Flow is verified through each major flow path.

f. System alarms are operable. (FSAR Section 9.2.7.5)

(P-39.1) Condensate Demineralizer System

Test Objective - The test objective is to demonstrate the ability of the condensate demineralizer system to maintain makeup water chemistry and the ability of the precoat and backwash systems to operate properly.

Prerequisites - To the extent necessary to support this test, construction is completed, and instrumentation and controls are operable. The condensate system is operable and lined up to recirculate water to the hotwells via the feed pump bypass and

startup recirculation lines. The instrument air system and process sampling systems are operational. Refueling water pumps are operational, and sufficient water is available in the refueling water tank to support this test. Low pressure air blower 10k105 is operational, and the backwash receiving tank is operational with sufficient volume to support this test.

Test Method - The filter/demineralizer units are placed in operation, and their controls are operated. Effluent water purity is verified. Flow rates, flow controls, and flow balancing system is verified. Manual and automatic precoat cycle operation is verified for each vessel.

(Vendor Technical Manual)

Acceptance Criteria

a. Vessel cleaning and precoat cycles operate properly.

b. Each demineralizer produces effluent water of the proper quality.

c. The system flow balancing system operates properly.

d. The cation and anion feeders supply resin to the precoat tank.

e. The precoat pump and the system hold pumps operate properly.

f. System pneumatic valves operate properly.

g. System controls, interlocks, and alarms operate properly.

(FSAR Section 10.4.6)

(P-41.1) Cooling Tower System

Test Objective - The test objective is to demonstrate the operability of the cooling tower chlorination system, sulfuric acid injection system, icing control system, and makeup water flow control valves.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The service water system, circulating water system, Schuylkill river makeup water system, Perkiomen Creek makeup water system, instrument air system, circulating water pumphouse domestic water supply, and the circulating water pump structure power roof ventilators are operational as required to support the test.

Test Method - The cooling tower chlorination system, sulfuric acid injection system, icing control system, and makeup water flow control valves are placed in operation. Each systems response to simulated cooling tower conditions is verified. System controls logics, and alarms are operated.

Acceptance Criteria (FSAR Section 10.4.5.1)

a. The cooling tower chlorination system operates properly.

b. The cooling tower sulfuric acid injection system operates properly.

c. The cooling tower icing control system operates properly.

d. The cooling tower makeup water flow control valves operate properly. (FSAR Section 10.4.5.2)

e. System alarms operate properly. (FSAR Section 10.4.5.1.5)

(P-42.1) Circulating Water System (Vendor Technical Manual)

Test Objective - The test objective is to demonstrate that the circulating water system delivers cooling water to the main condenser as designed.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The cooling tower is operational, and the circulating water system is filled sufficiently to operate the circulating water pumps. The main condenser is available to receive cooling water.

Test Method - The circulating water pumps and their controls are operated. System flows and flow paths are measured and verified. The waterbox scavenging pumps and their controls are operated. The main condenser fill and drain system is operated.

Acceptance Criteria (FSAR Section 10.4.5.1)

a. Circulating water pumps head and flow are within specified limits.

b. System automatic valves operate properly.

c. System controls, interlocks, and permissives operate properly.

d. Waterbox scavenging pumps operate properly. (FSAR Section 10.4.5.1)

e. Main condenser drain and fill system operates properly.

f. Circulating water ~~winter~~ bypass flow is within specified limits.

g. System alarms operate properly. (FSAR Section 10.4.5.1.5)

(P-43.1) Condenser and Air Removal System

Test Objective - The test objective is to demonstrate the ability of the main condenser air removal system to both pull and hold a vacuum in the main condenser.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are calibrated. The main turbine is on the turning gear, with steam seals established.

Test Method - With the turbine on turning gear and necessary support systems operating, the mechanical vacuum pumps are used to pull a vacuum in the main condenser. The steam jet air ejectors, using auxiliary steam, are then cut in to maintain a vacuum.

Acceptance Criteria (FSAR Section 10.4.2)

a. The mechanical vacuum pump pulls an acceptable vacuum.

b. The steam jet air ejectors maintain an acceptable vacuum.

c. System logics and alarms operate properly. (FSAR Section 10.4.2.5)

d. System offgas isolation operates properly.

(P-44.1) Condensate System

Test Objective - The test objective is to demonstrate both the ability of the condensate pumps to supply water to the feed system, and the proper operation of system controls.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

The feed system is available to provide a flowpath back to the main condenser. The condenser and the condensate storage system have sufficient water to operate the condensate pumps. Turbine enclosure cooling water is available.

Test Method - The condensate pumps and their controls are operated. System flows and flow paths are measured and verified. Automatic pump minimum flow control as well as the ability of the makeup and reject system to control hotwell level is demonstrated. Major valves are operated to demonstrate the ability to isolate sections of the system.

(FSAR Section 10.4.7.2.1)

Acceptance Criteria

a. Condensate pump head and flow meet acceptable values.

b. Pump controls, interlocks, and permissives operate properly.

c. System motor-operated valves operate properly.

d. System makeup valves and logics operate properly.

e. Condensate pump recirculation flow meets acceptable values.

f. System alarms operate properly. (FSAR 10.4.7.5)

(P-45.1) Feedwater System

Test Objective - The test objectives are to demonstrate the operability of the reactor feedwater pumps, their turbine drivers, and the feedwater control system, and to verify that the feedwater system functions to the degree that is possible with the limited steam available. The test is also intended to ensure that all feedwater instrument impulse lines connected to the RPV are clear and properly routed and that instrumentation associated with these lines properly responds to changes in the monitored system parameters.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The RPV has been flushed and is clean. All RPV instrument tubing has been filled, all instruments are vented, and proper valve lineup is verified. A source of demineralized water is available to fill the reactor pressure vessel. The reactor pressure vessel head is removed of the

vessel is adequately vented to prevent pressurization. The condensate system is available for supplying water to the feedwater pumps. The auxiliary steam system is able to supply steam to the feedwater pump turbine drivers. The main condenser is available to receive the turbine exhaust. The service water system is available to satisfy the system's cooling water requirements.

Test Method - The feedwater pump turbine drivers are first operated uncoupled from the pumps. After coupling and with the condensate system running, each feedwater pump is operated separately, recirculating water back to the condenser. System controls and alarms are actuated, including operation of the feedwater pump minimum flow valves and the feedwater pump turbine lube oil system. Raise and lower the reactor pressure vessel water level through the range of the reactor pressure vessel levels necessary to verify the proper tracking of each reactor vessel connected instrument. Feedwater control system inputs are verified. Various inputs are simulated and output response to small and large signal changes is checked.

Acceptance Criteria (FSAR Section 10.4.7.2.2)

a. The reactor feed pumps and turbines operate properly using the auxiliary steam supply.

b. Reactor feed pump recirculation valves operate properly.

c. Reactor feed pump turbine lube oil systems operate properly.

d. Reactor feed pump seals operate properly.

e. Feedwater control system inputs are operable.

f. Feedwater control system response is proper to simulated small and large signal changes. (FSAR Section 7.7.1.4)

g. System motor-operated and air-operated valves operate properly.

h. System instruments and alarms operate properly. (FSAR Section 10.4.7.3)

i. Each feed pump and its associated feedwater heater can be isolated for maintenance with pressure in the system.

j. Feedwater control system outputs are proper during simulated operation.

(FSAR Section 10.4.7.2.2)

(P-46.1) Extraction Steam and Feedwater Heater System

Test Objective - The test objective is to demonstrate operability of the extraction steam and feedwater heater level control and automatic isolation systems.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Turbine trip and pressure signals are simulated, and automatic isolation valve and bleeder trip check valve operation are verified. Feedwater heater level signals are simulated to verify proper response of drain valves, dump valves, bleeder trip valves, and extraction line drain valves. Feedwater heater dump and drain flow paths are verified. System alarms are actuated.

Acceptance Criteria (FSAR Section 10.2.2.4)

a. Bleeder trip check valve closing time and extraction line drain valve opening times are within specified limits.

b. Valve interlocks and logic are operable.

c. System alarms operate properly.

(P-49.1) Residual Heat Removal System

Test Objective - The test objective is to demonstrate that the RHR system delivers cooling water for each of the following system modes of operation: shutdown cooling, low pressure coolant injection (LPCI), suppression pool cooling, and fuel pool cooling.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The reactor pressure vessel (RPV) is available and filled with water above the minimum level required to provide suction to the RHR pumps. The recirculation loops are complete to the extent required for system operation in the shutdown cooling mode. The emergency service water system is available to provide cooling water to the RHR pumps. The suppression pool is available and filled above the low water level to provide suction to the RHR pumps. The fuel pool and fuel pool skimmer surge tanks are full of water and available for fuel pool cooling mode operation.

Test Method - The operating modes of the RHR system are initiated manually from the control room and remote shutdown panel and, where applicable, automatically. RHR pump performance is determined for each mode. System flow paths are verified. The containment spray flow path is demonstrated by an air flow test that overlaps with the pump water flow path. Adequate NPSH and absence of vortexing is verified over a range of suppression pool level from maximum to minimum calculated for 30 days after a LOCA. System controls and alarms are actuated. Watertight door gaskets and dogs are inspected and operated. Room flood detectors are operated.

Acceptance Criteria (FSAR Section 6.3.2.2.4 & and 5.4.7)

a. RHR pumps meet acceptable valves of head and flow for system operating modes.

b. System valves are operable from the control room, and all keylocks operate properly.

c. The system operates properly to provide supplemental fuel pool cooling.

d. The system operates properly in the shutdown cooling mode.

e. The system operates properly in the suppression pool cooling mode. (FSAR Section 7.3.1.1.5)

f. The system operates properly in the LPCI mode. (FSAR Section 7.3.1.1.4)

g. Head spray valves and logic operate properly.

h. Steam condensing valves and logic operate properly.

i. Containment spray valves and logic operate properly. (FSAR Section 7.3.1.1.4)

j. The RHR room flood detector operates properly.

k. System alarms operate properly.

l. The condensate transfer system and the safeguard piping fill pumps are each capable of maintaining full RHR pump discharge lines. (FSAR Section 6.3.2.2.6)

m. Remote shutdown panel instrumentation and controls operate properly.

n. System overpressure protection interlocks operate properly.

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(FSAR Table 6.3.2.2-1)

o. NPSH is within specified limits, and no vortexing is present.

p. Watertight doors exhibit a full seal when dogged down.

(Vendor Specification)

(P-50.1) Reactor Core Isolation Cooling System

Test Objective - The test objective is to demonstrate the operability of the RCIC system in delivering water to the reactor vessel and to verify proper separation of the RCIC DC components by observing the effect of disconnecting the RCIC DC bus on RCIC operation.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The condensate storage tank and suppression pool are filled above the low water level to provide suction to the pump, and auxiliary steam is available to supply steam to the RCIC pump turbine driver.

Test Method - RCIC system operation is initiated from the control room and remote shutdown panel by manual and automatic start signals. Pump and turbine performance is verified. System controls and alarms are actuated. During system operation, disconnect the RCIC DC bus and verify inoperability of the RCIC system. Adequate NPSH and absence of vortexing is verified over a range of suppression pool levels from maximum to minimum calculated for 30 days after a LOCA. Watertight door gaskets and dogs are inspected and operated. Room flood detectors are operated.

Acceptance Criteria (FSAR Sections 5.4.6 and 7.4.1.1)

a. The RCIC turbine controls and logic operate properly.

b. The RCIC pump and turbine operate properly using their auxiliary steam supply.

c. System manual and automatic initiation logic operate properly.

d. The RCIC room flood detector operates properly.

e. System alarms operate properly.

f. Securing of the RCIC DC bus results in inoperability of the RCIC system.

(FSAR Sections 5.4.6 and 7.4.1.1)

g. Remote shutdown panel instrumentation and control operate properly.

h. NPSH is within specified limits, and no vortexing is present.

i. Watertight doors exhibit a full seal when dogged down. (Vendor Specification

Full flow and minimum start time criteria are not demonstrated until nuclear steam is available during the power test program.

(P-51.1) Core Spray System

Test Objectives - The test objective is to demonstrate that the core spray system delivers water spray to the reactor core.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The condensate storage tank and the suppression pool are filled above the low water level. The RPV head is off, and the vessel is available to receive water from the core spray system.

Test Method - Core spray system operation is initiated and pump flow rates are measured in the various design modes of operation. System performance is verified. System controls and alarms are actuated. The safeguard piping fill system is operated and safeguard piping leakage is monitored. Adequate NPSH and absence of vortexing is verified over a range of suppression pool levels from maximum to minimum calculated to 30 days after a LOCA.

Acceptance Criteria (FSAR Sections 6.3.2.2.3 and 7.3.1.1.1.)

a. The core spray pumps meet acceptable head and flow values.

b. System manual and automatic initiation is proper.

c. System motor-operated valves operate properly.

d. The core spray room flood detector operates properly.

e. Systems alarms operate properly.

f. Safeguard piping fill pumps operate properly and keep core spray discharge piping full.

(FSAR Sections 6.3.2.2.3 and 7.3.1.1.1.3)

g. The condensate transfer system is capable of maintaining full core spray discharge lines.

h. Total leakage from all safeguard piping fed by the safeguard piping fill pumps does not exceed the capability of the fill pumps.

i. Core spray flow rates from the suppression pool to the reactor vessel are set to meet acceptance criteria by adjusting the size of the spray line discharge orifice.

j. System overpressure protection interlocks operate properly.

k. NPSH is within specified limits, and no vortexing is present.

(P-52.1) High Pressure Coolant Injection System

Test Objective - The test objective is to demonstrate that the HPCI system delivers cooling water to the RPV as designed.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The condensate storage tank and the suppression pool are filled above the low water level to provide suction to the pump. The auxiliary boiler is available to provide steam to the HPCI pump turbine driver.

Test Method - With the HPCI pumps uncoupled, performance of the turbine driver is measured, including operation of the turbine control and trip system. Limited pump operation (coupled) is conducted for all modes of operation (to the extent possible using auxiliary steam). System performance is determined. System controls and alarms are actuated. Adequate NPSH and absence of vortexing is verified over a range of suppression pool levels from maximum to minimum calculated for 30 days after a LOCA. Watertight door gaskets and dogs are inspected and operated. Room flood detectors are operated.

Acceptance Criteria

(FSAR Sections 6.3.1.2.1 and 7.3.1.1.1.1)

a. The HPCI turbine controls and logic operate properly.

b. The HPCI pump and turbine operate properly using the auxiliary steam supply.

c. System auto-start, shutdown, and restart occur properly.

d. Manual operation of system components is acceptable.

(FSAR Sections 6.3.1.2.1 and 7.3.1.1.1.1)

e. Controls affecting the transfer of HPCI pump suction water supplies operate properly.

f. The HPCI room flood detector operates properly.

g. System alarms operate properly.

h. The condensate transfer system and a safeguard piping fill pump are each capable of maintaining a full HPCI pump discharge line.

(Vendor Specification)

i. NPSH is within specified limits, and no vortexing is present.

j. Watertight doors exhibit a full seal when dogged down.

Full flow and minimum start time criteria are not demonstrated until nuclear steam is available during the startup test program.

(FSAR Sections 6.3.2.2.1.1 and 6.3.2.2.1.2)

(P-53.1) Standby Liquid Control System

Test Objective - The test objective is to demonstrate the operation of the standby liquid control system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The reactor pressure vessel is available for demineralized water injection. The standby liquid control tank is filled with demineralized water.

Test Method - The standby liquid control system is manually placed in operation to the reactor in conjunction with the test firing of each squib operated valve. System performance is determined, including pump flow rates and tank heater operation. System controls and alarms are actuated.

Acceptance Criteria

a. The standby liquid pumps meet acceptable values of flow and discharge pressure. (FSAR Section 3.9.3.1.12)

b. The standby liquid control tank temperature is controlled properly.

c. System manual initiation, both local and remote, operates properly.

d. System alarms operate properly.

(FSAR Section 9.3.5)

e. For each train, the connected explosive valve opens and the simulated squib fuse blows in the unconnected valve circuit. (FSAR Section 9.3.5)

(P-54.1) Emergency Service Water System

Test Objective - The test objective is to demonstrate that the ESW system supplies cooling water to safeguard equipment as designed.

Prerequisites - To the extent necessary for performance of this test, construction is completed, and instrumentation and controls are operable and calibrated. The cooling tower basin is operable, and the spray pond is at its normal operating level to provide water for the ESW pumps. The heat exchangers served by this system are available to provide a flow path for the pumps. Applicable portions of the RHRSW system are operable to support the flow verification test.

Test Method - The ESW system pumps are started manually and automatically. System controls in the control room and the remote shutdown station are operated and pump flow rates are measured. System alarms are also actuated.

Acceptance Criteria (FSAR Sections 9.2.2 and 7.3.1.1.11)

a. System pumps meet acceptable head and flow values for the various design flow paths.

b. System pump auto-start features operate properly.

c. System valves, controls and instrumentation are operable from both the control room and the remote shutdown panel; all keylocks and valve automatic features operate properly.

d. System alarms operate properly.

(P-55.1) Control Rod Drive Hydraulic System

Test Objective - The test objective is to demonstrate that the control rod drive (CRD) hydraulic system, including CRD mechanisms, hydraulic control units, power supply, instrumentation, and controls, meet acceptance requirements.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The condensate transfer and storage

system, and the reactor manual control system are available and operational to support the system test. The turbine enclosure cooling water system is available and operational to provide the cooling water requirement of the drive water pumps. The compressed air system is available and operational to provide the instrument air requirements of the system.

Test Method - The CRD hydraulic system is placed in operation utilizing the flow and pressure control stations. Pump controls are operated and flow rates measured. Control rod drives are exercised to verify latching, position indication, and stroke speeds. Scram times are measured for each control rod.

Acceptance Criteria (FSAR Sections 4.6.1 and 4.6.3)

a. The CRD hydraulic supply and discharge sections supply water at acceptable flow and pressure to the hydraulic control units.

b. Each hydraulic control unit operates properly to drive its control rod at proper speeds.

c. Position indication and latching operate properly.

d. System alarms operate properly.

(P-56.1) Reactor Manual Control System

Test Objective - The test objective is to demonstrate: proper operation of the reactor manual control system, including relays, control circuitry, switches, rod blocks, indicating lights, and control valves; and proper operation of the rod worth minimizer and the rod sequence control system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - System integrated operation is initiated manually. Controls are operated, and simulated signals are applied to verify: rod blocks; alarms and interlocks and control functions of the reactor mode switch; operation of the rod position information system and rod drift alarm circuit; and directional control valve time sequence for insert and withdraw commands. Proper operation of the rod worth minimizer and rod sequence control system are verified utilizing actual control rod manipulations.

Acceptance Criteria (FSAR Section 7.7.1.2)

a. The system operates properly during both insert and withdrawal cycles.

b. Rod block functions, interlocks, bypasses, and indications meet design intent.

c. Rod position indication is operable.

d. System alarms operate properly.

A (P-57.1) Uninterruptible ac Power System

Test Objective - The test objective is to demonstrate the proper operation of the uninterruptible ac power system.

Prerequisites - To the extent necessary to perform this test, construction is completed and instrumentation and controls are operable and calibrated. The 125/250 V dc and 440 V motor control center buses are available for energization of the 120 V uninterruptible ac distribution panel.

Test Method - The 120 V uninterruptible ac distribution panels are energized from the 440 V ac power system and transfer to the 125/250 V dc power system is initiated. Other system controls and alarms are also actuated.

Acceptance Criteria (Vendor Technical Manual)

a. System static inverters operate properly while supplying a design value of load.

b. System static inverter transfer time between alternate and preferred sources is acceptable. (FSAR Section 7.2.1.13)

c. System 440 V ac and 125/250 V dc breakers operate properly.

d. System bus voltages are acceptable.

e. System ac electrical power is available to all system distribution panels. (Electrical Single Line Diagram)

(P-58.1) Reactor Protection System

Test Objective - The test objective is to demonstrate that the reactor protection system (RPS) operates properly during integrated system functions.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - The various RPS sensors, sensor relays and devices will be actuated and timed to designated points along the scram chain logic. RPS response measurements will be run twice for each channel. The plant operating technical specification trip set points will be demonstrated at least one time by actual application of an input to the sensor/device or stroking an associated value to actuate position switches as appropriate.

Acceptance Criteria (FSAR Section 7.2)

a. System input scram function signals cause trips within design values.

b. System actuated logics operate properly.

c. Scram modes and bypasses operate properly.

d. Response time of the scram chain from sensor actuation through initiating logic and 90% rod insertion is within design values.

e. System indicators and alarms operate properly.

(P-58.2) Redundant Reactivity Control System for ATWS

Test Objective - The test objective is to demonstrate proper operation of the redundant reactivity control system logic and to verify proper response in those systems it affects.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are calibrated and operable. The following systems are available for operation: standby liquid control; RCIC; control rod drive; reactor recirculation; average power range monitors; feedwater; HPCI and RHR. The reactor vessel, condensate storage tank, and suppression pool are filled with demineralized water.

Test Method - The ATWS logic is operated manually and also automatically by using simulated reactor vessel water level and steam dome pressure signals. APRM power level will also be simulated. Where appropriate, signals from the RPS will be inhibited to allow independent demonstration and redundancy verification of ATWS logic and results. Resultant actions of recirculation pump trip, alternate rod insertion, and standby liquid control start will be verified. Manual operation or operating limit reset of a system while under the influence of an ATWS logic signal will be demonstrated as appropriate.

Acceptance Criteria (FSAR Section 7.6.1.8)

a. System sensing devices, trip systems, and actuator logics operate and trip within design limits.

b. System alarms and indications operate properly.

c. System logic and its action on other systems is independent and redundant.

(P-52.1) Containment Isolation and Nuclear Steam Supply Shutoff System

Test Objective - The test objective is to demonstrate that the primary containment isolation and nuclear steam supply shutoff system actuates the isolation valves following simulated primary containment isolation signals.

Prerequisites - To the extent necessary to perform this test, construction is completed and instrumentation and controls are operable and calibrated. Isolation valves actuator trip relays are placed in untripped condition. Primary containment isolation valves are operable.

Test Method - The actuator trip relay for each isolation valve is operated using simulated signals as necessary to create a trip condition. The actuator trip relay then operates the corresponding isolation valve. System alarms are also actuated.

Acceptance Criteria (FSAR Section 7.3.1.1.2)

a. System sensing devices, trip systems, and actuator logics operate and trip within design limits.

b. Closing times for valves closed by this system are within acceptable values. (FSAR Section 6.2.4)

c. System alarms operate properly. (FSAR Section 7.3.1.1.2)

(P-59.2) Primary Containment Integrated Leak Rate Test

Test Objective - The test objective is to determine the leakage rate in the primary containment at the peak calculated accident pressure and to determine the bypass leakage from the drywell to the containment at the peak drywell to wetwell differential pressure and reduced differential pressure. In addition, the test will verify the proper connection and tracking of the containment pressure instruments.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The Type B and C testing has been completed in accordance with Chapters 6 and 16. The integrated leakage rate measurement system is calibrated and operational. All containment pressure instruments have been calibrated and are valved into service.

Test Method - The containment is pressurized, and the absolute pressure, dry bulb temperature, and dew point temperature (water vapor pressure) within the containment and the drywell are recorded to determine the leak rate. The containment is depressurized, the drywell is pressurized to reduced test pressure, and data are taken to determine the drywell bypass leakage rate. As containment pressure is increased during the containment integrated leak rate test, proper tracking of all containment pressure instruments is verified.

Acceptance Criteria (FSAR Section 6.2.6)

The primary containment and drywell bypass leakage rates are within acceptable limits, ~~in accordance with Chapter 16.~~ All containment instruments track properly, and all affected instrument lines are clear of obstructions.

(P-59.3) Suppression Pool, Pool Cleanup and Vacuum Relief

Test Objectives - The test objective is to demonstrate the operability of the suppression pool cleanup and vacuum relief system, the suppression pool level instruments, and system valves.

Prequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The suppression pool is sufficiently full of water and the condenser hotwell is available.

Test Method - The suppression pool cleanup system is operated, and the pump flowrate measured. The suppression pool level is varied, and the operability of the pool level instruments is verified. Primary containment vacuum relief valves and pressure instruments are also operated.

Acceptance Criteria

a. The suppression pool cleanup pump meets acceptable head and flow values. (Vendor specification)

b. Primary containment vacuum relief valves operate properly. (FSAR SECTION 7.3.2.6.1.1)

c. System motor-operated valves operate properly. (FSAR SECTION 6.4.2)

d. Suppression pool level instruments operate properly.

e. System alarms operate properly. (FSAR SECTION 6.3.2.2.3)

f. Containment pressure indicators used to track accident conditions operate properly. (FSAR SECTION 7.5.1.4.2.1)

(P-60.1) Drywell HVAC System

Test Objective - The test objective is to demonstrate the operability of the primary containment ventilation system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Chilled water flow balancing is complete. Drywell air balancing is complete.

Test Method - The ventilation system fans and chillers are operated. Controls and alarms are actuated.

Acceptance Criteria

a. Drywell unit coolers and fans operate properly. (FSAR Section 9.4.5.2

b. Drywell chilled water circulation pumps operate properly.

c. Drywell water chillers operate properly. (FSAR Section 9.2.10.1)

d. System isolation and control valves operate properly.

e. System alarms operate properly. (FSAR Sections 9.2.10.1 and 9.4.5.2)

(P-61.1) Reactor Water Cleanup System

Test Objective - The test objectives are to demonstrate the operability of the reactor water cleanup (RWCU) system and to verify that the system functions properly.

Prerequisites - To the extent necessary for performance of this test, construction is completed, and instrumentation and controls are operable and calibrated. The demineralizers are precoated, as required, and ready to process system flow. The reactor enclosure cooling water system is available to satisfy the system's cooling requirements.

Test Method - The recirculation pumps are operated and their performance characteristics are determined. Data are obtained during demineralizer cleanup, backwash, and precoat operations. System controls and alarms are actuated, including operation of the system isolation valves. Simulated signals are used as required.

Acceptance Criteria (FSAR Section 5.4.8)

a. System pumps meet acceptable values of head and flow.

b. Filter precoat and backwash cycles operate properly.

c. System isolation valves operate properly (Vendor Technical Manual)

d. System flow circuits operate properly.

e. System alarms operate properly.

(P-62.1) Reactor Vessel and Auxiliaries

Test Objective - The test objective is to detect damage, excessive wear, loose parts, or other evidence of unacceptable vibration which could result from assembly errors or undesirable deviations from the previously qualified prototype plant construction.

This test is a quality assurance measure which experimentally confirms the absence of excessive vibration of core support structures, jet pumps, lower plenum components, and other major internal structures. The test is conducted without fuel, and is not intended to be a test of fuel or incore instrument vibration. However, the specified test conditions, without fuel present, provide a level of vibration excitation of major internal structures which is at least as high as that measured in normal power operation.

Prerequisites: To the extent necessary to perform this test, all reactor internals components are installed, except:

a. The core matrix is empty; there are no fuel assemblies, incore instrumentation tubes, or neutron source rods. Control blades are withdrawn or not installed. Fuel support castings are installed.

b. The dryer assembly need not be installed.

c. One of the access hole covers on the shroud support plate must remain unwelded until after the test to provide access for inspection. A temporary closure must be provided.

The reactor vessel is closed, filled, and ready for pressurization. The recirculation pumps are operable. RHR system pumps are operable to provide necessary temperature rise. The CRD system is operable to control reactor vessel pressure. Clean-up system heat exchangers are operable for temperature control.

Test Method - A visual inspection is made before and after the required 100% speed pump runs. These flow runs include 35 hours of two-loop operation and 14 hours each for loops A and B. The total run time is 63 hours. These hours may not be sequential, but they must be between the initial and final inspections.

Acceptance Criteria

Initial and final inspection results are acceptable. (FSAR Section 3.9.2.4)

(P-64.1) Reactor Recirculation System

Test Objective - The test objectives are to demonstrate that the reactor recirculation system components function properly, and to

demonstrate the flow performance of the system to the degree possible prior to fuel loading.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The RPV is available and filled with demineralized water above the minimum level required for reactor recirculation pumps operation. The reactor building cooling water system and drywell chilled water system are available to provide the cooling water requirements of the pumps.

Test Method - The recirculation pumps are operated at various speeds while corresponding pump flow rate and head characteristics are determined. The system is tested by individual and group operation of the pumps, motor-generator (MG) sets, valves and controls. System interlocks and alarms are actuated, using simulated signals as required.

Acceptance Criteria

(FSAR Sections 5.4, 6 and 7.7.1.3)

a. Recirculation pumps meet acceptable values of head and flow for various motor input frequencies.

b. System flow instrumentation operates properly.

c. Recirculation pump isolation valves operate properly.

d. System alarms are operable.

e. System control logic operates properly.

f. MG sets operate properly.

g. MG sets' lube oil system operates properly.

(P-65.1) Radwaste Enclosure HVAC System

Test Objective - The test objective is to demonstrate the ability of the radwaste enclosure HVAC system to provide air flow and maintain temperature control in the radwaste enclosure, equipment compartment, service and control, and fume hood areas. Additional objectives are to demonstrate the ability of the charcoal vault cooling system to maintain temperature control in charcoal vaults 1, 2, and 3, and the ability of the radwaste enclosure HVAC system to maintain positive air flow from clean areas to areas of increasing potential contamination.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The plant heating steam system, instrument air system, and drywell chilled water system are operational.

Test Method - System fans and filter units are placed in operation. System controls and interlocks are operated. The charcoal vault cooling system and controls are operated. System temperature control valves response to temperature controls are verified. System alarms are activated.

Acceptance Criteria (FSAR Section 9.4.3)

a. System supply and exhaust fans operate properly.

b. System temperature control valves respond to temperature controls.

c. System filter units operate properly.

d. Supply and exhaust fan controls and interlocks operate properly.

e. The charcoal vault cooling system operates properly.

f. Compartment differential pressures are maintained.

g. System alarms operate properly. (FSAR Section 9.4.3.5)

(P-66.1) Reactor Enclosure Unit Coolers

Test Objective - The test objective is to demonstrate the capability of the reactor enclosure unit coolers to provide cooling air flow to the reactor core isolation cooling (RCIC), core spray (CS), residual heat removal (RHR), and high pressure coolant injection (HPCI) safeguard pump compartments.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The emergency service water system is operational. Applicable portions of the HVAC air balancing test are completed.

Test Method - The unit coolers are placed in operation. Pump compartment temperature variations are simulated and system response is verified. Unit cooler component interlocks are

verified. The emergency service water system is operated throughout the test, and automatic initiation of cooling water flow to the unit coolers is verified. System alarms are verified under actual or simulated conditions as practicable. System parameters are monitored and recorded for systems cooling ECCS equipment. Heat removal capacity is calculated.

Acceptance Criteria (FSAR Section 9.4.2)

a. The unit coolers operate properly.

b. The unit coolers auto-start features and interlocks operate properly in both the automatic and standby modes.

c. The unit coolers respond properly to temperature variations within the respective pump compartments.

d. Cooling water flow is initiated whenever the applicable unit cooler is energized.

e. System alarms operate properly.

(P-66.2) - Control Enclosure Unit Coolers

Test Objective - The test objective is to demonstrate the capability of the control enclosure unit coolers to provide cooling air flow to the standby gas treatment system (SGTS) room and access.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The control structure chilled water system is operational. Applicable portions of the HVAC air balancing test are completed.

Test Method - The unit coolers are placed in operation. SGTS room and access temperature variations are simulated and system response is verified. Unit cooler component interlocks are verified. The control structure chilled water system is operated and automatic initiation of chilled water flow to the unit coolers is verified. System parameters are recorded, and heat removal capacity is calculated.

Acceptance Criteria (FSAR Section 9.4.1)

a. The unit coolers operate properly in the RUN, AUTO, and STBY modes.

b. Chill water inlet valves open when their associated unit cooler fan starts.

c. Chill water pumps start whenever one of the unit are operable from both the control room and the remote shutdown panel; coolers they supply starts.

d. SGTS access dampers open when their associated unit cooler fan starts.

e. SGTS unit cooler heat removal capacity is within specified limits.

(P-68.1) Solid Radwaste System

Test Objective - The test objective is to demonstrate the operability of the solid radwaste system including the radwaste solidification system.

Prerequisite - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Demineralized water is available.

Test Method - The solid radwaste system is tested with actual, nonradioactive, representative waste streams, which include backwash resins from reactor water cleanup, fuel pool cleanup, and condensate cleanup. The system is tested to ensure that these representative waste streams can be processed from their respective collection tanks through the phase separators, centrifuges and drumming process. Major operations verified in the test include the ability to mix sludge/resins and water in the backwash and sludge tanks to produce transportable mixtures, use of the phase separator tanks to concentrate sludge and resins by the decanting process prior to discharging to the centrifuges and high integrity containers.

Acceptance Criteria (FSAR Section 11.4)

a. System pumps operate properly and ~~are able to agitate~~ contents of tanks and to transport slurry mixtures.

b. System alarms and controls operate properly.

c. System components (e.g., centrifuges, tank agitators, transfer carts, radwaste crane, etc,) operate properly

d. System discharge product meets chemical requirements as identified in Chapter 11. (FSAR Section 11.4)

(P-69.1) Equipment Drain Collection and Storage System

Test Objective - The test objective is to demonstrate the ability of the equipment drain system to collect, store, and transfer potentially contaminated low conductivity liquid wastes.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - System pumps are operated in both manual and automatic modes. Power operated valves are cycled in both manual and automatic modes. System alarms are verified by using actual or simulated conditions, as practical. Containment isolation signals are initiated to verify valve interlocks. Sumps fitted with positive exhaust connections are smoke-tested.

Acceptance Criteria (FSAR Section 9.3.3.3 and 11.2)

a. System pumps operate satisfactorily.

b. System pumps operate in both manual and automatic modes.

c. System power operated valves operate in both manual and automatic modes.

d. Containment isolation valve interlocks operate.

e. Sump exhausts draw room air into sump.

f. System alarms operate.

(P-69.3) Liquid Radwaste System

Test Objectives - The test objectives are to demonstrate the ability of:

a. The equipment drain subsystem to transfer and process potentially contaminated low conductivity liquid wastes.

b. The flow drain subsystem to collect, transfer, and process potentially contaminated high conductivity liquid wastes.

c. The fuel pool filter precoat and backwash system to clean and precoat both the equipment drain and floor drain filters.

d. The chemical waste subsystem to collect and transfer corrosive liquid wastes.

e. The laundry drain subsystem to collect, transfer, and process liquid detergent wastes.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. System filters have been precoated and system demineralizers have been loaded with resin.

Test Method - The liquid radwaste system is operated with representative nonradioactive waste influent. Equipment and subsystems to be tested include equipment and floor drain processing, chemical waste, and laundry drains. System pumps are operated in both manual and automatic modes. The fuel pool precoat and backwash system is operated to clean and precoat both the equipment drain and the floor drain filters. System alarms are verified by using actual or simulated conditions where practical. The effluent of each filter and demineralizer is sampled to ensure that it is of acceptable quality. Power operated valves are cycled in both manual and automatic modes.

Acceptance Criteria (FSAR Section 11.2)

a. System pumps operate satisfactorily.

b. System pumps operate in both manual and automatic modes.

c. Fuel pool filter precoat and backwash system cleans and precoats both the equipment drain and floor drain filters.

d. System power operated valves operate in both manual automatic modes.

e. The equipment and floor drain subsystems produce condensate quality water.

f. The laundry drain subsystem produces water of acceptable quality to discharge to the environment.

g. Contents of the chemical waste tank can be mixed and neutralized prior to discharge for processing.

h. System alarms operate. (FSAR Section 11.2)

(P-70.1) Standby Gas Treatment System (SGTS)

Test Objective - The test objective is to demonstrate the capability of the SGTS to function properly.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The reactor enclosure H&V system and the turbine enclosure vent north stack are available and operational to support the system test.

Test Method - The secondary containment is isolated, and the SGTS is started automatically by a simulated refueling area or reactor enclosure isolation signal. The SGTS and secondary containment isolation performance is determined by measuring secondary containment pressures, system pressures, and fan air flow rates. System controls and alarms are actuated.

Acceptance Criteria (FSAR Section 6.5.1.1 and 7.3.1.1.7)

a. System fans, both singularly and in combinations, provide acceptable values of flow thru the system filters.

b. Fan interlocks, auto-start and shutdown features, and damper logic operate properly.

c. System filter units operate properly, and in-place efficiency test results are satisfactory.

d. System alarms operate properly.

(P-72.1) Gaseous Radwaste Recombiners and Filters

Test Objective - The test objective is to demonstrate the operability of the gaseous radwaste system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Nitrogen and auxiliary steam are available as required. Service water and reactor enclosure cooling water are operable, and the turbine enclosure ventilation stack is available for discharges.

Test Method - System recombiner and charcoal treatment trains are operated and their performance is verified.

Acceptance Criteria (FSAR Section 11.3)

a. System recombiner and charcoal treatment trains operate properly.

b. System controls and alarms operate properly.

(P-73.1) Containment Atmosphere Control System

Test Objective - The test objectives are to demonstrate the ability of the containment atmosphere control system to provide accurate analysis of containment oxygen and hydrogen content and to demonstrate the operability of the hydrogen recombiner packages. The actual hydrogen-oxygen recombination process is not demonstrated at this time.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - The combustible gas analyzer packages are operated and system flow rates determined. Gas samples containing known concentrations of oxygen and hydrogen are introduced into the system to verify proper response of the gas concentration indicating and recording equipment. The hydrogen recombiner system is operated, and system flow rates determined. System controls and alarms are actuated.

Acceptance Criteria (FSAR Section 9.4.5.1)

a. System atmosphere control isolation valves operate properly.

b. Containment hydrogen recombiners meet acceptable values of flow and temperature.

c. System hydrogen/oxygen analyzers operate properly.

d. System alarms operate properly.

(P-76.1) Process Sampling System

Test Objective - The test objective is to demonstrate the ability of the process sampling system to provide various process samples with adequate flow indication to installed analytical monitoring equipment and grab samples stations.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Each sample station is operated and grab samples are drawn as available. Chemical fume hoods and the turbine enclosure sample station drain recovery tank pumps are operated. System alarms are actuated.

Acceptance Criteria (FSAR Section 11.5)

a. Sample lines are unobstructed.

b. Grab sample valves operate properly.

c. The turbine enclosure sample station drain recovery tank pumps operate properly.

d. The chemical fume hoods operate properly.

e. System alarms operate properly.

(P-78.1) Startup Range Detector Drive Control and Neutron Monitoring System

Test Objective - The test objective is to demonstrate the operability of the startup range neutron monitoring (SRM) system which includes both source and intermediate range neutron monitoring equipment.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Each source and intermediate range detector is positioned from its fully inserted position to its fully retracted position to demonstrate the operability of the insert/retract mechanisms. Using simulated input signals, each source and intermediate range detector loop is tested to

demonstrate meter indication, trip circuit operation, retract and insert permissives, associated rod block signals, and alarm operation.

Acceptance Criteria (FSAR Section 7.7.2.6)

a. The startup range drive system is capable of positioning each detector through its full length of travel.

b. Startup range neutron flux level and rate circuits indicate properly.

c. Startup range trip signals operate properly.

d. Startup range selector switch logic and insert/retract permissives operate properly.

e. Startup range rod block signals are generated per design.

f. System alarms operate properly.

(P-78.2) Power Range Neutron Monitoring System

Test Objective - The test objective is to demonstrate the operability of local power range neutron monitoring (LPRM) and the average power range neutron monitoring (APRM) systems.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Each LPRM channel is tested using simulated signals to its tripping, alarm, or indicating function. Each APRM channel is tested for its tripping, alarm, or indicating function using simulated signals from the LPRM. Simulated recirculation flow signals are also utilized to provide the bias for varying the rod block and trip set points. Simulated signals are used to test the rod block monitor outputs.

Acceptance Criteria (FSAR Section 7.6.1.4)

a. The local power range neutron flux circuits operate properly and are capable of providing signals to the APRM system, the rod block monitor subsystem, the process computer, and to LPRM system indicating meters and auxiliary devices.

b. LPRM and APRM system trip signals operate properly.

c. Average power range power level circuits operate properly.

d. System alarms operate properly.

e. Rod block monitor outputs operate.

(FSAR Section 7.6.1.4)

P-78.3) Traversing Incore Probes (TIP) Calibration System

Test Objective - The test objective is to demonstrate the operability of the traversing incore probes (TIP) calibration system and to verify the system functions properly.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The primary containment instrument gas is available, as required, for purging the system.

Test Method - Verification that the system operates in the manual, automatic, and hand crank modes. Indexer cross-calibration interlock, shear valve control monitor, TIP automatic detector withdrawal, containment secure and squib circuits verification, ball valve control, ball valve-open interlock, and purging operations are conducted. System manual and automatic controls and alarms are actuated and the ability to override automatic functions is demonstrated.

Acceptance Criteria (FSAR Section 7.7.1.6.3)

a. The automatic and manual modes function in the correct designed sequence.

b. System drive mechanisms, including position indication, and the drive interlocks and time delays operate properly.

c. System signal channels, indicators, recorders, and alarms operate properly.

d. The system indexing mechanism and its interlocks operate properly.

e. The system automatically withdraws the detectors on a containment isolation signal, after which the containment isolation valves close.

(P-79.1) Area Radiation Monitoring System

Test Objective - The test objectives are to demonstrate that the area radiation monitoring system is operable and has correct high and low and alarm settings.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Verification of the area radiation monitoring system capability is demonstrated by the integrated operation of the channel trip units, local and remote alarm annunciators, lights, and recorders. The site-environ radiation monitoring stations are tested for Unit 1 only, as this equipment is common to both Unit 1 and Unit 2.

Acceptance Criteria (FSAR Section 7.7.1.10)

a. Each area radiation monitoring channel operates properly.

b. Each area radiation monitoring channel high and low trip set point is set properly.

c. Each monitor responds properly to its internal check source.

d. The indicator and trip units properly initiate their respective indicators, alarms, and horns.

e. Each trip circuit produces an alarm upon interruption or failure of the ac power supply.

(P-79.2) - Process Radiation Monitoring System

Test Objective - The test objectives are to demonstrate that the process radiation monitoring system is operable and has the capability to detect a gross release of fission products from the fuel.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Verification of the process radiation monitoring system's capability is demonstrated by the integrated operation of the channel trip units, alarm annunciators, and lights and recorders. Test signals are fed into the monitors at the control modules.

Acceptance Criteria (FSAR Section 7.7.1.9)

a. Each process radiation monitoring channel operates properly.

b. The indicator and trip units properly operate their respective indicators and alarms.

c. As applicable, each monitor responds properly to its secondary check source.

d. Provides trip signals to initiate a reactor shutdown and containment isolation on detection of a gross release of fission products from the fuel.

(P-80.1) Reactor Vessel Instrumentation System

Test Objective - The test objective is to demonstrate that the reactor nonnuclear instrumentation and loose parts monitoring systems operate properly to provide trip, indication, and alarm information.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Relays that are initiated from the reactor vessel level and presssure sensors are placed in untripped condition.

Test Method - Simulated signals are introduced into the reactor nonnuclear instrument loops and proper trip, alarm, and indication outputs are verified. Loose parts monitoring sensors are actuated, and system response is verified.

Acceptance Criteria

a. System indications and trips operate properly.

b. System alarms operate properly.

(FSAR Sections 4.4.6.1 and 7.7.1.1)

(P-81.1) Fuel Handling System

Test Objective - The test objective is to demonstrate that the refueling platform and the various servicing tools can be used for their intended operations.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The reactor manual control system, fuel pool, and the reactor cavity and core structure are available for testing. Dynamic and static load tests of fuel handling equipment are completed.

Test Method - The fuel servicing equipment, refueling equipment, and servicing aids are operated. Their associated controls and alarms are actuated.

Acceptance Criteria (FSAR Section 9.1.4)

a. The fuel preparation machines operate properly.

b. The refueling platform operates properly.

c. Refueling interlocks and logic operate properly. (FSAR Section 7.7.1.15)

d. Fuel position indicators operate properly.

(P-83.1) Main Steam System

Test Objective - The test objective is to demonstrate the proper operation of the main steam system, including the main steam isolation valves (MSIVs), the leakage control system, and the automatic depressurization system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Primary containment instrument gas and instrument air are available to operate the main steam line isolation valves and safety/relief valves.

Test Method - The main steam isolation valve leakage control system's valves, blowers, heaters, and controls are operated. System logic, valve times, and flows are verified and measured. The MSIVs are stroked and timed in their various modes. The automatic depressurization system is functionally checked without

lifting pressure relief valves. Other main steam system controls and alarms are actuated.

Acceptance Criteria (FSAR Section 5.4.5)

a. The MSIVs stroke properly in the manual mode (fast and slow).

b. The MSIVs' automatic closure is within acceptable times.

c. MSIV control logic, indications, and alarms operate properly. (FSAR Section 7.3.1.1.2)

d. The MSIV leakage control system operates properly, valve times are as specified and system flows are acceptable. (FSAR Sections 6.7 and 7.3.1.1.3)

e. Nuclear system pressure relief valves control circuits operate properly. (FSAR Section 5.2.2)

f. The main steam line flow monitors operate properly. (FSAR Section 7.3.1.1.2)

(P-83.2) Automatic Depressurization System

Test Objective - The test objectives are to demonstrate the operability of the automatic depressurization system and to verify system response to signals from the logic channels.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - High drywell pressure and low reactor water level signals are simulated and system response to the logic channels is verified.

Acceptance Criteria (FSAR Section 7.3.1.1.1.2)

a. ADS channel A responds properly to signals from logic channels A and E.

b. ADS channel C responds properly to signals from logic channels C and G.

c. The core spray and residual heat removal pump permissive interlocks function properly.

d. ADS valves operate properly. (FSAR Section 5.2.2)

e. System instruments and alarms operate properly. (FSAR Section 7.3.1.1.1.2)

(P-83.3) Steam Leak Detection System

Test Objective - The test objective is to demonstrate that the steam leak detection system is operable and that system instruments have the correct trip and alarm set points.

Prerequisites - To the extent necessary to complete this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - System temperature changes are simulated at the system control sensors. Capability of system instrumentation to respond to temperature changes and alarm set points is verified. The generation of isolation signals to the channel trip units is verified.

Acceptance Criteria (FSAR Section 5.2.5.3 and 7.6.1.3)

a. System temperature monitors operate properly.

b. System alarms and indicators operate properly.

c. Isolation signals are generated by the applicable circuitry to the nuclear steam supply shutoff system (NSSSS), the high pressure coolant injection (HPCI) system, and the reactor core isolation cooling (RCIC) system.

(P-85.1) Cathodic Protection System

Test Objective - The test objective is to demonstrate the capability of the cathodic protection system to maintain buried steel piping and structures at the design electrical potential.

Prerequisite - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - The cathodic rectifiers are operated and voltage, current, and resistance measurements are made.

Acceptance Criteria

a. The electrical potential of buried steel piping and structures is maintained within specified limits. (Vendor Technical Manual)

b. The cathodic rectifiers operate properly.

(P-85.2) Freeze Protection and Heat Trace Systems

Test Objective - The test objective is to demonstrate the operability of the freeze protection and heat trace systems.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Each freeze protection and heat trace system is operated. Control setpoints are varied, and system response is verified. System alarms are actuated.

Acceptance Criteria

a. The freeze protection and heat trace systems energize and de-energize in response to the thermostatic controls.

b. System alarms operate properly. (Electrical Schematic Diagram)

(P-91.1) Plant Annunciator Systems

Test Objective - The test objective is to demonstrate the ability of the plant annunciator systems to provide both audible and visual indications of an alarm condition.

Prerequisites - To the extent necessary to perform this test, construction is completed and plant annunciator panels are operable.

Test Method - Annunciator panel test devices are operated. Alarm contacts are jumpered to demonstrate annunciator operability.

Acceptance Criteria (Electrical Schematic Diagram)

a. The main control room annunciators operate properly.

b. The radwaste control room annunciators operate properly.

(P-93.2) Main Turbine Control System

Test Objective - The test objective is to demonstrate the ability of the electrical-hydraulic control (EHC) system to operate the turbine-generator.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. The hydraulic fluid reservoir is filled with EHC fluid.

Test Method - The hydraulic system is placed in operation and alarms, trips, and control devices are actuated.

Acceptance Criteria (FSAR Section 7.7.1.5 and 10.2)

a. Hydraulic system pressure meets acceptable values. (Vendor Technical Manual)

b. Valves operate properly.

c. System alarms operate properly.

d. System trips operate properly.

(P-93.3) Main Turbine Supervisory System

Test Objective - The test objective is to demonstrate the ability of the turbine supervisory system to monitor the operation of the main turbine and the reactor feedpump turbines.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation is operable and calibrated.

Test Method - Signal inputs are simulated in the turbine supervisory system, and recording equipment and alarms are actuated.

Acceptance Criteria

a. Instrumentation operates properly. (Vendor Technical Manual)

b. System alarms operate properly. (FSAR Section 10.2.5)

(P-99.1) Reactor Enclosure Crane

Test Objective - The test objective is to demonstrate the capability of the reactor enclosure crane to safely move expected loads within the reactor enclosure.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Construction proof testing as identified in Section 9.1.5 has been completed.

Test Method - The crane is used to maintain its nominal rated load in a static position. Test loads are lifted and travel limits, as well as hoist, trolley, and bridge travel speeds, are measured. System controls and alarms are actuated.

Acceptance Criteria (FSAR Section 9.1.5)

a. The crane load capacity is within specified limits.

b. Crane controls, alarms, interlocks, and limits operate properly.

c. Crane protective devices and interlocks operate properly.

d. Equipment safety devices operate properly.

(P-99.2) Seismographical Monitoring System

Test Objective - The test objective is to demonstrate the ability of the seismographical monitoring system to measure and record seismic data.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated.

Test Method - Earthquake conditions are simulated by applying a physical force to the seismic sensors. Automatic system operation is verified.

Acceptance Criteria

a. Peak acceleration recorders operate properly. (Vendor Technical Manual)

b. Strong motion accelerographs operate properly.

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(FSAR Section 3.7.4)

c. Seismic triggers operate properly.

d. Magnetic tape playback system operates properly.

e. Response spectrum analyzer operates properly.

f. System alarms operate properly.

(P-99.3) Public Address and Evacuation System

Test Objective - The test objective is to demonstrate the ability of the public address and plant maintenance/test jack systems to transmit voice communication and the plant evacuation alarm and river warning systems to broadcast various alarms and prerecorded messages to selected areas.

Prerequisites - To the extent necessary to perform this test, construction is completed, and equipment is operational.

Test Method - Each public address station is operated in both the page and party line modes. Station-to-station voice transmittals are made from each station in the plant maintenance/test jack system. Evacuation alarm and river warning signals are simulated, and system operation is verified.

Acceptance Criteria

(FSAR Section 9.5.2)

a. The public address system is operable from all stations in the page and party line modes.

b. All public address speakers operate properly.

c. The plant maintenance/test jack system operates properly.

d. The evacuation alarm system operates properly.

e. The river warning system operates properly.

f. The evacuation alarm system auto transfer power switch operates properly.

(FSAR Section 9.5.2.2.4)

(P-100.1) Loss of Offsite Power Test

Test Objective - The test objective is to demonstrate that the plant systems are capable of operating as expected on an

integrated basis in normal, surveillance, and emergency modes, and thus are ready for fuel loading.

Prerequisites - Selected preoperational tests are performed prior to or concurrent with operation of equipment for the cold functional test.

Test Method - Plant operating procedures are utilized, to the extent practicable, to place plant systems in service on an integrated basis for normal, surveillance, and emergency modes. The standby diesel generators are operated in all possible combinations, in response to simulated loss of power, and loss-of-coolant accident conditions.

Equipment parameters are allowed to stabilize for each operational combination, and any abnormal conditions are investigated. Equipment not under test is monitored to verify the absence of voltage.

Acceptance Criteria

a. Integrated system performance, to the extent possible during the test, is satisfactory. (Vendor Test Specification)

b. System electrical and mechanical is satisfactory.

(P-100.2) Loss of Instrument Air

Test Objective - The test objective is to demonstrate the design response to a loss-of-instrument-air accident of components supplied by the system.

Prerequisites - To the extent necessary to perform this test, construction is completed, and instrumentation and controls are operable and calibrated. Cooling water is available to meet the requirements of the system. There are no essential plant systems operating that will be affected by performance of this test.

Test Method - The system is placed in operation, and components to be tested are placed in a position other than the failed position. Instrument air is shut off in a manner that would simulate an instrument air pipe break and the loss of instrument air by moisture freezing and plugging the main supply line. Movements of the affected components and adequacy of feeders to share the decaying air supply are verified. The test is rerun with the components in their normal operating position.

(System P&ID's)

Acceptance Criteria

a. Proper movement of affected components is verified.

b. Feeders or branches sustain an adequate share of the decaying air supply as required by the operational mode.

(P-100.3) Mechanical Snubber Testing

Test Objective

The test objective is to verify adequate pre-service examination to mechanical snubbers on all safety-related systems.

Prerequisites

All pre-installation, installation, and post-installation inspections have been performed on mechanical snubbers by designated inspection organizations.

Test Method

Verify through document review that all inspection activities have been completed, verified, and signed. Reviews will be made by system, and additional visual inspections will be made if original inspections are performed more than 6 months prior to initial heatup of the system.

Acceptance Criteria (FSAR Sections 3.9.2 and 3.9.3)

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

b. Location, orientation, position setting, and configuration are according to design drawings and specifications.

c. Snubbers are not seized, frozen, or jammed.

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

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

If inspections for items a and d are performed more than 6 months prior to initial system heatup, reverify and document.

(SUT-16) Core Power Distribution

Test Objectives - The test objectives are: to demonstrate the reproducibility of the traversing incore probes (TIP) system readings, to determine the core power distribution in three dimensions, and to determine core power symmetry.

Prerequisites - The core is at steady-state power level with equilibrium xenon. It remains in this condition with no control rod motion or change in core flow until completion of the TIP traces.

Test Method - The rod pattern and all APRM system and LPRM system readings are recorded. TIP reproducibility is checked with the plant at steady-state condition by producing several TIP traces in the same location, with each TIP machine. The traces are evaluated to determine the extent of deviations between traces from the same TIP machine.

Core power distribution, including power symmetry, is obtained during the power ascension program. Axial power traces are obtained at each of the TIP locations. Several TIP systems have been provided to obtain these traces. A common location can be traversed by each TIP chamber to permit intercalibration. The results of the complete set of TIP traces are evaluated to determine core power symmetry.

Acceptance Criteria - The TIP system error level is within the specified limits. Core power distribution in these dimensions and core power symmetry are within specified limits.

(Vendor Test Specification)

(SUT-17) Core Performance

Test Objective - The test objective is to evaluate the principal thermal and hydraulic parameters associated with core behavior.

Prerequisites - The plant is operating in an essentially steady-state condition.

Test Method - With the core operating in a steady-state condition, the core performance evaluation is used to determine the principal thermal and hydraulic parameters associated with core behavior. These parameters are: core flow rate, core thermal power level, MAPLHGR, maximum local linear heat generation rate (MLHGR), core minimum critical power ratio (MCPR), and MFLPD.

Acceptance Criteria - The principal thermal and hydraulic parameters associated with core behavior meet appropriately calculated limits. (Vendor Test Specifications and Plant Technical Specifications)

(SUT-18) Flux Response to Rods

Test Objective - The test objective is to demonstrate the stability of the core local power-reactivity feedback mechanism with regard to small perturbations in reactivity caused by rod movement.

Prerequisites - The core is maintained in a steady-state condition prior to starting of this test.

Test Method - The control rod and LPRM systems are selected. Rod movement tests are made at chosen power levels, and LPRM response data are gathered. These empirical data are evaluated to determine the local core dynamic effects, resulting from rod movement.

Acceptance Criteria - The decay ratio must be within acceptable tolerance for each process variable that exhibits oscillatory response to control rod movement.

(SUT-19) Pressure Regulator Response

Test Objectives - The test objectives are: to demonstrate the reactor pressure control system responses to pressure regulator set point changes, the stability of the reactivity-void feedback loop to pressure perturbation, the control characteristics of the bypass and control valves, and the takeover capabilities of the backup pressure regulator; and to optimize the pressure regulator settings to give the best combination of fast response and small overshoot.

Prerequisites - Fuel loading is completed and nuclear steam is available.

Test Method - The pressure set point is decreased rapidly and then increased rapidly by about 10 psi. The response of the system is measured in each case. The backup regulator is tested by increasing the operating pressure regulator setpoint rapidly, until the backup regulator takes over control. The load reference set point is reduced, and the test is repeated with the bypass valve having control. The response of the system is measured and evaluated, and the regulator settings are optimized.

water level scram following the trip of one feedwater pump. The feedwater pumps and turbine drivers perform within specified limits. (Vendor Test Specification)

(SUT-21) Main Steam Isolation Valves (MSIVs) Performance Verification

Test Objectives - The test objectives are: to functionally check the MSIVs for proper operation at selected power levels; to determine reactor transient behavior during and following simultaneous full closure of all MSIVs, and following closure of one valve; and to determine isolation valve closure time.

Prerequisites - Fuel loading is completed, and nuclear steam is available.

Test Method - Functional checks (10% closure) of each isolation valve are performed at selected reactor power levels. A test of simultaneous full closure of all MSIVs is performed at about 100% of rated thermal power. Operation of the RCIC and safety/relief valves is shown. Reactor process variables are monitored to determine the transient behavior of the system during and following full isolation. The MSIVs closure times are determined.

Acceptance Criteria - MSIV closure times are within applicable limits. Reactor pressure is maintained below specified values during the transient following full closure of all MSIVs.

(SUT-22) Main Steam Relief Valves (MSRVs) Performance

Test Objectives - The test objectives are: to demonstrate proper operation of the dual purpose MSRVs; to determine their capacity; and to demonstrate their leaktightness following operation.

Prerequisites - Factory calibration data are verified, and setting adjustment mechanism factory seals, if applicable, are intact. The reactor is on pressure control with adequate bypass or main steam flow.

Test Method - The MSRVs are opened manually so that only one is opened at any time. The capacity of each MSRV is determined by the amount the bypass or control valves close, to maintain reactor pressure. Proper resetting of each MSRV is verified by observing temperatures in the MSRV discharge piping.

Acceptance Criteria - Each MSRV compares favorably with the value assumed in the accident analysis at design reactor pressure. Following the capacity test, the leakage of each MSRV is low enough to allow the temperature measured by the thermocouples, in the discharge side of the valves, to fall within an acceptable margin of the temperature recorded, before the valve was opened.

(SUT-23) Main Turbine Valves Surveillance Test

Test Objective - The test objective is to demonstrate acceptable procedures for routine surveillance testing of the turbine stop, control, and bypass valves at a power level as high as possible, without producing a reactor scram.

Prerequisites - The main turbine is operational, and the power testing program is in progress.

Test Method - The individual turbine valves are closed at several points along the 100% power flow control line, to establish the maximum possible power level for performance of this test, without producing a reactor scram. Turbine bypass valves are opened and flow is measured.

Acceptance Criteria - With the plant at power and testing in progress, peak neutron flux is at a value below the scram setting. Peak reactor pressure is at a value below the high-pressure scram setting. Peak steam flow in the main steam lines remains at values below the high flow isolation trip setting. Turbine bypass valve flow capacity compares favorably with the value assumed in the accident analysis. (Vendor Test Specification)

(SUT-24) Shutdown from Outside the Main Control Room Demonstration

Test Objective - The test objective is to demonstrate that the power plant can be safely shut down from outside the control room, to demonstrate that the power plant can be maintained in a hot standby condition from outside the control room, and to demonstrate that the power plant can be safely cooled from hot standby to cold shutdown conditions from outside the control room.

Prerequisities - Preoperational testing of plant instrumentation, controls, and systems to be used at the remote shutdown station have been completed. Fuel loading is completed, and the power ascension testing program is in progress.

Acceptance Criteria - The turbine control valves and the stop valves close during the stop valve fast closure test. Feedwater settings prevent flooding of the steam lines following these transients. The measurement of simulated heat flux is not significantly greater than pre-analysis. The trip at 25% power does not cause a scram. The pressure regulator regains control before a low-pressure reactor isolation occurs.

(SUT-26) Recirculation Flow Control Demonstration

Test Objective - The test objective is to determine the plant response to a change in recirculation flow, to optimize the setting of the master flow controller, and to demonstrate the plant loading capability in master manual flow control mode.

Prerequisites - The reactor is in a steady-state condition and the feedwater system is operating in three-element control.

Test Method - Data are recorded during the step and ramp changes. The final controller settings for both the master flow controller and the individual loop speed controllers are determined.

Acceptance Criteria - The decay ratio for each process variable that exhibits oscillatory response to flow control changes is acceptable. The plant response to a change in recirculation flow is acceptable. The plant loading capability in the master manual flow control mode is acceptable. (Vendor Test Specification)

(SUT-27) Recirculation System Trip Demonstration

Test Objectives - The test objectives are: to determine transient responses and steady-state conditions following recirculation pump trips at selected power levels; to obtain jet pump performance data; and to demonstrate that no recirculation system cavitation occurs in the operation region of the power flow map.

Prerequisites - The recirculation system preoperational test is completed; the process computer is available; and power testing is in progress.

Test Method - Single-pump and two-pump trips are performed from full specified power levels. The single-pump trips are initiated by opening the generator field breaker on the applicable motor generator. The two-pump trips are initiated by tripping the motor-generator set drive motors. Reactor pressure, reactor