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SEP 27 1984

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

Docket Nos.: 50-352
50-353

Subject: Limerick Generating Station, Units 1 and 2
FSAR Chapter Fourteen Changes
Procedures and Test Review Branch (PTRB)

File: GOVT 1-1 (NRC)

Dear Mr. Schwencer:

FSAR Table 14.2-3 provides abstracts of the Startup Test Procedures to be performed during the Startup Test Program and FSAR Figure 14.2-5 indicates startup test sequence.

In order to clarify the test objectives, prerequisites, test methods and acceptance criteria as described in each of these abstracts to better reflect the actual plans of the Startup Test Program the following draft FSAR page changes to table 14.2-3 are enclosed. FSAR figure 14.2-5 (Startup Test Sequence) has also been revised to reflect the current startup test sequence as indicated on the attached draft FSAR page change to figure 14.2-5.

The responses to request for additional information (RAI) numbers 640.9 and 640.22 have been revised to be consistent with the above FSAR changes.

The attached draft FSAR page changes will be incorporated into the FSAR, exactly as it appears in the attachments in the revision scheduled for November, 1984.

Sincerely yours,

V. S. Boyer
for J.S.K.

RJS/mlb/09278402

cc: See Attached Service List

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A PDR

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QUESTION 640.9 (Section 14.2.12)

Several of the acceptance criteria do not reflect complete accomplishment of the test objectives. Modification should be made so that when the acceptance criteria has been met, the test objective will have been achieved. Modify the individual test descriptions indicated below to provide consistency between the test objectives and the acceptance criteria.

(1) Table 14.2-3 SUT-7 Test objective is to demonstrate operation of water level instrumentation under various conditions. Acceptance criteria references only normal operating conditions.

(2) Table 14.2.3 SUT-16 Provide acceptance criteria for determination of core power distribution and for determination of core power symmetry.

(3) Table 14.2-3 SUT-17 Provide acceptance criteria for evaluation of principal thermal and hydraulic parameters.

(4) Table 14.2-3 SUT-20 Acceptance criteria is very broad and open to interpretation. Does not ensure that test objectives have been met. Acceptance criteria needs to be more specific.

(5) Table 14.2-3 SUT-23 The acceptance criteria could be met with the reactor shut down. The acceptance criteria does not ensure that the objectives have been met.

(6) Table 14.2-3 SUT-26 Acceptance criteria does not address response to change in recirculating flow and the loading capability in master manual flow control mode.

RESPONSE

(1) The Test Objective section of startup test SUT-7 has been changed to change ~~"various conditions" to "hot standby and full power conditions."~~ "UNDER VARIOUS CONDITIONS" TO "AT NORMAL OPERATING PRESSURE AND TEMPERATURE."

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QUESTION 640.22 (Section 14.2.12)

We have noted on other plant startups that the capacities of main steam relief valves (SUT-22) and turbine bypass valves (SUT-23) are sometimes in excess of the values assumed in the accident analyses for inadvertent opening or failure of these valves. Provide a description of the testing that demonstrates that the capacity of these valves is consistent with your accident analysis assumptions.

RESPONSE

A sentence has been added to the Acceptance Criteria of Startup test SUT-22 that the capacity of the main steam relief valves compares favorably with the value assumed in the accident analysis. Startup test SUT-23 25 has been changed to include a measurement of the bypass valve flow capacity with the acceptance criterion that the capacity of the turbine bypass valves compares favorably with the value assumed in the accident analysis.

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TABLE 14.2-3 (Page 1 of 24)

STARTUP TEST PROCEDURE (STP) ABSTRACTS

(STP-1) Chemical and Radiochemical (Formerly SUT-1)

Test Objectives - The test objectives are to ensure that the systems provide adequate means to maintain control and knowledge of the quality of the plant systems chemistry and to ensure that the sampling equipment, procedures, and analytic techniques are adequate to supply the data required to demonstrate that the fluids meet quality specifications and process requirements. They must also monitor the integrity of the fuel, the operation of the demineralizers and filters, the condenser tube integrity, the operation of the offgas system, and the tuning of certain process instruments.

Prerequisites - Instrument calibration and preoperational testing of chemical, radiation, and radiochemical monitors are completed AND A SET OF CHEMICAL AND RADIOCHEMICAL SAMPLES WERE TAKEN TO FUNCTIONALLY CHECK SAMPLE STATIONS.

Test Method - Prior to fuel loading, a ~~complete~~ set of chemical and radiochemical samples is taken ~~to ensure that all sample stations are functioning properly, and~~ to determine initial concentrations. Subsequent to fuel loading, during reactor heatup, and at each major power level change, samples are taken and measurements are made FOR SELECTED SYSTEMS to determine the chemical and radiochemical quality of reactor water and reactor feedwater, the amount of radiolytic gas in the steam, gaseous activities after the air-ejectors, decay times in the offgas lines, and the performance of filters and demineralizers. Monitors in the liquid waste system and liquid process lines are adjusted as required. The chemical and radiochemical monitors and the sample system operation verify that the system is capable of providing true samples at proper flow, temperature, and/or moisture content, as applicable, so that means are available for the reliable analysis of the process by instrumentation or plant personnel.

Acceptance Criteria - Water quality remains within applicable guidelines, and gaseous and liquid effluent activities conform with plant requirements.

(STP-2) Radiation Measurements (Formerly SUT-2)

Test Objectives - The test objectives are: to determine the background gamma and neutron radiation levels in the plant environ prior to operation in order to provide base data on activity buildup and shielding adequacy; and to monitor radiation at selected power levels to ensure the protection of personnel, and continuous compliance with the guideline standards of 10 Code of Federal Regulations (CFR) Part 20 during plant operation.

Prerequisites - A survey of natural background radiation is made at selected locations throughout the plant site.

Test Method - Subsequent to fuel loading, during reactor heatup, and at various selected power levels, gamma radiation level measurements and, where appropriate, neutron dose rate measurements are made at significant locations throughout the plant site. Potentially high radiation areas are surveyed.

Acceptance Criteria - Plant radiation doses and personnel occupancy times are controlled within allowable limits as defined in 10 CFR Part 20.

(STP-3) Fuel Loading (Formerly SUT-3)

Test Objective - The test objective is to load fuel safely and efficiently to the full core size.

Prerequisites - The preoperational test program test results have been reviewed and approved, and a Nuclear Regulatory Commission (NRC) license has been issued to Philadelphia Electric Company (PECo). A neutron source is installed near the center of the core. At least three neutron detectors, calibrated and connected in a non-coincident mode to high flux scram trips, are located to produce acceptable signals during loading. Final testing of this reactor protection system and final reactor coolant leak rate testing have been completed.

Test Method - The fuel loading procedure includes the loading sequence, pattern, and records for logging, a running inventory of fuel status, control rod checks, minimum shutdown checks, neutron monitoring, subcritical multiplication behavior, communication requirements, safety requirements, emergency procedures, and additional checks to be performed during fuel loading.

Fuel loading begins at the center of the core and proceeds radially to the fully loaded configuration. The following checks are performed as each cell is loaded:

a. Subcriticality Check - A control rod, surrounded by fuel in the vicinity of the cell to be loaded, is completely withdrawn; the core must remain subcritical. Then the rod is re-inserted.

INSERT (A)

(A)

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During the loading of each cell, two fuel assemblies will be loaded in the location not occupied by the blade guide. The blade guide will be removed and loading of the cell will be completed. A control rod functional check verifying the operability of the control rod and drive will be performed on each cell after the cell is loaded. This functional check may also serve as a subcritical check to verify that the next cell may be safely loaded.

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b. Control Rod Function Test - The rod in the cell to be loaded is completely withdrawn and re-inserted.

c. Fuel Loading - Two fuel assemblies are loaded, the blade guide removed, and the remaining two fuel assemblies loaded to complete the four assembly cell.

d. The Subcriticality Check is repeated.

e. The Control Rod Functional Test is repeated. This also serves as a Subcriticality Check on the loaded fuel cell.

Acceptance Criteria - The core is fully loaded in accordance with established procedures, and the core is subcritical.

(STP-4) Full Core Shutdown Margin (Formerly SUT-4)

Test Objective - The test objective is to demonstrate that the reactor is sufficiently subcritical throughout the first fuel cycle, with any single control rod fully withdrawn.

Prerequisites - The core is fully loaded; the subcritical checks are completed; and the source range monitors (SRMs) and intermediate-range monitors (IRMs) are installed in the vessel and connected in a non-coincident mode, to scram at a high neutron level. The rod worth minimizer and rod sequence control system are operational.

Test Method - The shutdown margin test is performed by fully withdrawing a series of previously selected rods until criticality is reached. The empirical data are analyzed and compared with calculated data to determine the test results.

Acceptance Criteria - The basic criterion for reactivity control is that the core, in its maximum reactivity state at any time in the cycle, be sufficiently subcritical, with the strongest rod withdrawn, and all other rods fully inserted. Satisfactory completion of the shutdown margin test ensures, at the time of fuel loading, that this criterion has been met.

(STP-5) Control Rod Drive (CRD) System (Formerly SUT-5)

Test Objectives - The test objectives are to demonstrate that the CRD system operates over the full range of primary coolant temperatures and pressures, from ambient to operating, and to determine the initial operating characteristics of the entire CRD system.

Prerequisites - The process computer, scram time recorder, or equivalent recording equipment is online and available to monitor events; the CRD electrical and hydraulic system preoperational testing is completed satisfactorily; and the vessel water level is always above the upper core grid during all CRD movements. The reactor protection system preoperational test is completed, and the scram pilot valves are ready for energization.

Test Method - During fuel load, a visual check is made of the position indication of each control rod, and the four-rod displays are checked for missing numbers. Insert and withdrawal times are verified during fuel load, and again at rated pressure ~~simultaneously with scram testing following fuel load.~~ FOR SELECTED RODS. SCRAM TESTING WILL BE PERFORMED FOLLOWING FUEL LOADING AND AT RATED PRESSURE. Coupling checks are again verified by the operator. Friction testing is conducted by measuring the pressure differential between the insert and withdrawal lines during the continuous insertion of a control rod.

Acceptance Criteria - Scram times and friction test results fall within acceptance limits. Each CRD has normal insert and withdrawal times within the limits indicated.

(STP-6) SRM Performance and Control Rod Sequence (Formerly SUT-6)

Test Objective - The test objective is to demonstrate that the sources and SRM system provide sufficient information for knowledgeable and controlled reactor startup at low neutron levels.

Prerequisites - Fuel loading is completed, neutron sources are in place, and the core is clean and cold with all control rods inserted.

Test Method - All ~~fuel assembly, source or~~ control rod movement or operation are in compliance with approved owner operating procedures. ~~The readings from the fuel load chambers are recorded. After all sources are installed, the core loading matrix is verified, and all control rods, adjacent to fuel assemblies, disturbed during source movement are functionally tested.~~ The SRMs are connected, and subcritical testing verifies SRM response to control rod withdrawal. With the SRMs ~~calibrated,~~ OPERATIONAL criticality is approached. Records are maintained of count rate, rod configuration, and times. Criticality is achieved by withdrawing rods in the designated sequence.

Acceptance Criteria - SRMs are ~~calibrated~~ OPERATIONAL and read onscale within the designed range for a cold clean core. ~~SRMs sufficiently overlap with IRMs to ensure that design requirements are met.~~

(STP-9) Water Level Reference Leg Temperature (Formerly SUT-7)

Test Objective - The test objective is to demonstrate the calibration and agreement of the installed reactor vessel water level instrumentation ~~under various hot standby and full power conditions.~~ AT NORMAL OPERATING PRESSURE AND TEMPERATURE.

Prerequisites - The following are determined and recorded: elevations of instrument taps, condensing chambers, head chambers indicating zero water level, and instrument ranges. The reactor is in a steady-state condition during each stage of testing. Air temperature in the vicinity of the level columns is stabilized.

Test Method - The test will be done at rated temperature and pressure and under steady-state conditions; the reference leg temperature will be measured and compared to the value assumed during initial calibration. If the difference exceeds operating tolerances, the instruments will be recalibrated using the measured value.

Acceptance Criteria - The installed reactor water level indication and controls provide accurate information and sufficient operating tolerances under normal operating conditions.

(STP-10) IRM Performance (Formerly SUT-8)

Test Objective - The test objective is to demonstrate IRM system response to neutron flux and IRM overlap with the SRM AND APRM systems.

Prerequisites - Fuel loading is completed, and the reactor is just critical. IRM gains are set at maximum for conservatism.

Test Method - After criticality and when flux level is sufficient, IRM response to neutron flux and ~~to~~ the IRM-SRM overlap is verified. The SRMs and IRMs may then be taken out of non-coincident scram. Following average power range monitor (APRM) calibration in accordance with another procedure, the IRM gains may be adjusted ~~if necessary. If any adjustments are made, the SRM-IRM overlap is verified at the first opportunity.~~ TO OPTIMIZE THE IRM OVERLAP WITH THE SRMs AND APRMs.

Acceptance Criteria - Resulting IRM ~~performance satisfies applicable design criteria~~ OVERLAP WITH THE SRMs AND APRMs IS ESTABLISHED WITHIN ACCEPTABLE LIMITS.

(STP-11) Local Power Range Monitoring(LPRM) Calibration (Formerly SUT-9)

Test Objective - The test objective is to calibrate the LPRM system.

Prerequisites - Reactor power and LPRM gains are sufficient to observe chamber response to the adjacent control rod during calibration of any LPRMs. The ability of the APRM system to provide input to the reactor protection system is maintained during this test. The process computer or offline computer is available.

Test Method - The core is operated in a specified test condition, for a period sufficient to obtain short-term equilibrium conditions. LPRMs are calibrated in accordance with the calibration procedure. The meter reading of each LPRM chamber is proportional to the average heat flux in the four adjacent fuel rods at the height of the chamber.

Acceptance Criteria - LPRM calibration, in accordance with the procedure, is satisfactorily completed.

(STP-12) APRM Calibration (Formerly SUT-10)

Test Objective - The test objective is to calibrate the APRM system.

Prerequisites - The core is at steady-state condition at the desired power level and core flow rate. Control rod positions and core flow are not changed during the time data are taken for these calibrations.

Test Method - With the core in a steady-state condition, calculations are made of the percent of rated power ~~indicated~~ by a ~~the~~ heat balance~~, on the core performance~~. The APRMs are calibrated to agree with the calculated power value.

Acceptance Criteria - The APRMs are calibrated to read equal to or greater than the calculated core thermal power.

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<u>(STP-13) Process Computer Performance Verification</u> (Formerly SUT-11)

<u>Test Objective</u> - The test objective is to demonstrate the ability of the process computer to provide accurate information pertaining to plant process variables under operating conditions.

<u>Prerequisites</u> - Fuel loading is completed to the extent necessary to perform this test. Applicable field inputs are terminated, computer room heating, ventilation, and air conditioning (HVAC) is operational, and the computer is operational, with plant data ~~from ambient conditions~~ available.

<u>Test Method</u> - Following fuel loading, and during plant heatup and ascension to rated power, plant process variables, sensed by the computer as digital or analog signals, are recorded~~, as they vary from their ambient conditions~~. Performance calculation programs are run, and the results recorded.

<u>Acceptance Criteria</u> - Programs P-1, OD-1, and OD-6 are considered operational when:

a. The MFLCPR, calculated by an independent method, and calculated by process computer, either:

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

   2. When the MFLCPR calculated by the process computer is in a different assembly than that calculated by the independent method, the MFLCPR calculated by the two methods agree withinin 2%, for each assembly.

b. The maximum fraction of limiting power density (MFLPD), calculated by the independent method, and by the process computer, either:

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

   2. When the MFLPD calculated by the process computer is in a different assembly than that calculated by the independent method, the MFLPD calculated by the two methods agree within 2%, for each assembly.

c. The maximum average planar linear heat generation rate (MAPLHGR), calculated by the independent method, and the process computer, either:

1. Are in the same fuel assembly and do not differ in value more than 2%

2. When the MAPLHGR calculated by the process computer is in a different assembly than that calculated by the independent method, the MAPLHGR calculated by the two methods agree within 2%, for each assembly.

d. The LPRM calibration factors calculated by the independent method and the process computer agree to within 2%.

e. The remaining programs are considered operational upon successful completion of the static and dynamic testing.

(STP-14) Reactor Core Isolation Cooling (RCIC) System Performance Verification (Formerly SUT-12)

Test Objective - The test objective is to demonstrate operation of the RCIC system over its required operating pressure range.

Prerequisites - The preoperational test of the RCIC system is completed. Fuel loading is completed, and sufficient nuclear steam is available to operate the RCIC pump throughout its operating range.

Test Method - A controlled NOMINAL start of the RCIC system is done at a reactor pressure of ~150 psig, and an automatic actuation start is done at RATED ~~a~~ reactor pressure~~ of nominal 1000 psig~~. Verify the proper operation of the RCIC system and determine the time to reach rated flow. These tests may first be performed with the system in the test mode, so that discharge flow is not routed to the reactor pressure vessel. The final demonstration is made so that disharge flow is routed to the reactor pressure vessel while the reactor is at partial power. A cold quick start is performed with the system on the full flow test loop.

Acceptance Criteria - The RCIC system must have the capability to deliver specified flow, in less than or equal to the rated actuation time, against nominal rated reactor pressure.

(STP-14.1) Reactor Isolation Cooling (RCIC) System Startup After Loss of AC Power to the System (Formerly SUT-12.1)

Test Objective - The test objective is to demonstrate the ability of the system to start without the aid of AC power with the exception of the RCIC DC/AC inverters.

Prerequisites - The preoperational test of the RCIC system is completed. Fuel loading is completed, and sufficient nuclear steam is available to operate the RCIC pump throughout its operating range. Power to ~~all~~ RCIC components fed by site AC power is secured, and the station batteries are fully charged.

Test Method - A manual initiation of the RCIC system is accomplished at RATED ~~the~~ reactor pressure ~~of nominal 1000 psig~~ to verify the proper operation of all components to reach rated flow.

Acceptance Criteria - The RCIC system must have the capability to deliver specified flow against nominal rated reactor pressure without the normal AC site power supply.

(STP-14.2) Reactor Core Isolation Cooling (RCIC) System Operation with a Sustained Loss of AC Power to the System
(Formerly SUT-12.2)

Test Objective - The test objective is to verify the operation of the RCIC beyond its design basis to evaluate the limits of the system operation with extended loss of AC power to the RCIC system and support systems with the exception of the RCIC DC/AC inverters.

Prequisites - The preoperational test of the RCIC system is completed. Fuel loading is completed, and sufficient nuclear steam is available to operate the RCIC pump throughout its operating range. The RCIC system valves are in a normal standby lineup with suction from the condensate storage tank (CST). Power to ~~all~~ RCIC components fed by site AC power is secured including the RCIC area coolers and battery chargers supplying the station battery from which the RCIC DC loads are powered. The RCIC batteries are fully charged. Instrument air is available for operation and controls of the appropriate valves.

Test Method - Start and operate the RCIC system with return to the CST and run the system for two hours or until any system limiting parameter is approached (e.g.: high RCIC area temperature, low battery voltage or high suppression pool temperature). During this period, trip and restart the RCIC system two additional times.

Acceptance Criteria - No defined acceptance criteria. The purpose of the test is to verify the operation of RCIC beyond its design basis. ~~to coordinate the limits of system operation.~~

(STP-15) High Pressure Coolant Injection (HPCI) System Performance Verification (Formerly SUT-13)

Test Objective - The test objective is to demonstrate proper operation of the HPCI system over its required operating pressure range.

Prerequisites - The preoperational test of the HPCI system is completed. Fuel loading is completed, and sufficient nuclear steam is available to operate the HPCI pump throughout its operating range.

Test Method - Controlled starts of the HPCI system are done at reactor pressures near 150 and RATED ~~1000 psig~~ during the heatup phase, and an automatic ~~initiation~~ start is initiated. ~~at full pressure.~~ Verify the proper operation of the HPCI System, determine the time to reach rated flow, and adjust the flow controller in the HPCI System for proper flow rate. These tests are performed with the system in the test mode, so that discharge flow is not routed to the reactor pressure vessel. The final demonstration is made so that discharge flow is routed to the reactor pressure vessel, while the reactor is at partial power.

Acceptance Criteria - The HPCI turbine must not trip off during startup. The HPCI system must have the capability to deliver specified flow, in less than or equal to rated actuation time, against nominal rated reactor pressure.

(STP-16) Selected Process Temperatures Verification (Formerly SUT-14)

Test Objectives - The test objectives are: to establish the proper setting for the low-speed limiter for the recirculation pumps, to keep the bottom head water temperature from being too low; and to demonstrate that the bottom head drain temperature corresponds to bottom head coolant temperature, during normal operation.

Prerequisites - The reactor is in a ~~hot standby~~ LOW POWER condition.

Test Method - With recirculation pumps at approximately ~~[illegible]~~ 28% of maximum speed, allow the reactor to attain a steady-state condition. Data are recorded; then the speed of the pumps is slowly lowered until 20% of maximum speed or the minimum stable speed is reached, whichever is greater. Data are again recorded. The empirical data are analyzed to determine the optimum low speed limiter setting.

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<u>(STP-18) TIP Uncertainty</u> (Formerly SUT-16)

<u>Test Objectives</u> - The test objectives are: to demonstrate the reproducibility of the traversing incore probes (TIP) system readings.

<u>Prerequisites</u> - 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.

<u>Test Method</u> - 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.

<u>Acceptance Criteria</u> - The TIP system error level is within the specified limits.

<u>(STP-19) Core Performance</u> (Formerly SUT-17)

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

<u>Prerequisites</u> - The plant is operating in an essentially steady-state condition.

<u>Test Method</u> - 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.

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

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.

Acceptance Criteria - The decay ratio is acceptable for each process variable that exhibits oscillatory response to pressure regulator changes.

During the simulated failure of the primary controlling pressure regulator, the backup regulator is expected to control the transient so that the reactor does not scram.

Steady-state hunting or limit cycle characteristics due to control and valve deadband are acceptable at rated steam flow.

(STP-23) Feedwater Control System Demonstration (Formerly SUT-20)

Test Objectives - The test objectives are: to evaluate and adjust feedwater controls; to demonstrate the capability of the automatic flow runback feature to prevent a low water level scram, following the trip of one feedwater pump; to demonstrate acceptable performance of feedwater pumps and turbine drivers within specifications; to demonstrate adequate response to feedwater heater loss, ~~to demonstrate general reactor response to inlet subcooling changes~~ (INLET SUBCOOLING CHANGE) and to demonstrate acceptable reactor water level control.

Prerequisites - The reactor is operating at a steady-state condition, ~~greater than 10% power~~

Test Method - At power levels of 25, 50, 75, and 100 percent, the reactor water level set point is changed approximately ± 6 inches, to evaluate acceptability of the feedwater control systems at all modes of operation.

One of the three operating feedwater pumps is tripped at a power level such that the automatic flow runback circuit acts to drop power to within the capability of the remaining pumps.

The resulting transients from the loss of a feedwater heater are evaluated at nominal 30 and 90 percent power.

Feedwater pumps and turbine driver variables are monitored throughout power ascension testing to demonstrate operability within specified limits.

Acceptance Criteria - The decay ratio is acceptable for each process variable that exhibits oscillatory response to feedwater control system set point changes, when the plant is operating above the lower limit of the master flow controller. The system has the capacity for automatic flow runback to prevent a low water level scram following the trip of one feedwater pump. The feedwater pumps and turbine drivers perform within specified limits (Vendor Test Specification).

(STP-25) Main Steam Isolation Valves (MSIVs) Performance Verification (Formerly SUT-21)

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.

(STP-26) Main Steam Relief Valves (MSRVs) Performance (Formerly SUT-22)

Test Objectives - The test objectives are: to demonstrate proper operation of the dual purpose MSRVs 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. 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. 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.

(STP-24) Main Turbine Valves Surveillance Test (Formerly SUT-23)

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)~~

(STP-28) Shutdown from Outside the Main Control Room Demonstration (Formerly SUT-24)

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.

Test Method - Using only the minimum number of personnel in a shift crew required to be onsite at any one time, the reactor is manually scrammed and placed in hot standby condition from the remote shutdown station. The plant is maintained in hot standby condition for at least 30 minutes. Using additional personnel who could be made available prior to the time cooldown would be initiated, initiate a plant cooldown from hot standby conditions from outside the control room. Initiate RHR system operation and demonstrate the ability to achieve cold shutdown conditions from outside the control room.

Acceptance Criteria

a. Shutdown to hot standby can be achieved.

b. Plant can be maintained at stable hot standby.

c. (Reactor water level and pressure can be controlled.)

d. Reactor coolant temperature and pressure can be lowered sufficiently to place the RHR system in operation.

e. A heat transfer path to the spray pond can be established.

f. Cooldown with the RHR system can be controlled to a rate that would not exceed technical specification limits.

(STP-27) Turbine Trip and Generator Load Rejection Demonstration (Formerly SUT-25)

Test Objectives - The test objectives are: to determine the response of the reactor system to a turbine trip; and to evaluate the response of the bypass, safety/relief valve, and the reactor protection systems.

Prerequisites - Logic testing of generator lockouts to produce a direct turbine trip are completed. Fuel loading is completed, and the power testing is completed to the extent necessary for performing this test.

Test Method - Dynamic transients are induced at selected reactor power levels by manual turbine trips. Neutron flux, feedwater flow and temperature, and vessel water level and pressure are monitored. Responses of selected control valves, stop valves, safety/relief valves, and bypass valves are recorded. The peak values and the rate of change of both reactor power and reactor steam dome pressure are recorded. THE CAPACITY OF THE TURBINE BYPASS VALVES IS CHECKED.

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 LESS THAN 25% power does not cause a scram. The pressure regulator regains control before a low-pressure reactor isolation occurs. TURBINE BYPASS FLOW CAPACITY COMPARES FAVORABLY WITH THE VALUE ASSUMED IN THE ACCIDENT ANALYSIS (VENDOR TEST SPECIFICATION).

(STP-29) Recirculation Flow Control Demonstration (Formerly SUT-26)

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

Prerequisites - The reactor is operating in a steady-state condition. Flow instrumentation static calibration is completed prior to the first flow calibration. The zero setting on transmitters is checked and adjusted prior to a flow calibration.

Test Method - With the reactor in a steady-state condition, recirculation flow data are recorded. The data are analyzed to determine the required adjustments on APRM and rod block monitor (RBM) flow units, and the jet pump loop flow proportional amplifiers. The resulting settings are documented on the instrument data sheets, for the owner's records.

Acceptance Criteria - Jet pump flow instruments are adjusted so that the jet pump total flow recorder provides a correct core flow indication at rated conditions. The APRM/RBM flow-bias instrumentation is adjusted to function properly at rated conditions.

(STP-70) Reactor Water Cleanup System Performance Verification (Formerly SUT-31)

Test Objective - The test objective is to demonstrate specific aspects of the mechanical operability of the reactor water cleanup (RWCU) system.

Prerequisites - The RWCU system preoperational test is completed satisfactorily. The reactor is operated at, or near, rated temperature and pressure, long enough to achieve a steady-state condition.

Test Method - The system is operated in blowdown, hot SHUTDOWN ~~standby,~~ and normal modes to provide data for analysis. The system is allowed to stabilize in each mode prior to recording of data. These data are analyzed to determine the test results.

Acceptance Criteria - The data indicates operation in the listed modes is satisfactory.

(STP-71) Residual Heat Removal (RHR) System Performance Verification (Formerly SUT-32)

Test Objectives - The test objectives are to demonstrate the ability of the RHR system to remove residual and decay heat from the nuclear system, so that refueling and nuclear system servicing can be performed. ~~and to condense steam while the reactor is isolated from the main condenser.~~

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Prerequisites - The RHR system preoperational test is completed satisfactorily. ~~The RCIC power test is completed prior to the steam condensing mode test.~~

Test Method - Two modes are tested to verify system capability under actual operating conditions. The modes to be tested are the shutdown cooling and the ~~steam condensing~~ SUPPRESSION POOL COOLING modes. During the operation, the heat transfer rate is controlled to maintain acceptable reactor pressure vessel RPV cooldown rates. Data are recorded before and during each portion of testing. The empirical data are analyzed to verify the satisfactory operation of the RHR system within the limits of acceptance criteria.

Acceptance Criteria - The RHR system is capable of operating ~~in the steam condensing mode (with one or both heat exchangers in service)~~ at an acceptable flow rate AND ~~The~~ heat removal capability, ~~and the times required to place the heat exchangers in the steam condensing mode using the RCIC system are acceptable.~~

(STP-34) Offgas System Performance Verification (Formerly SUT-33)

Test Objective - The test objective is to demonstrate proper operation of the offgas system under its expected operating conditions.

Prerequisites - Fuel loading is completed, and power ascension testing is in progress.

Test Method - At startup flow and again at normal flow, the FLOWS, TEMPERATURES AND pressures at selected locations are recorded and checked to see if they are within acceptable limits. The hydrogen ~~analyzer~~ CONCENTRATION, DRAINAGE OF CONDENSATE, ~~temperature, charcoal treatment operability,~~ dilution flow AND CHARCOAL SYSTEM OPERABILITY ~~radionuclide residence times, and filters~~ are checked periodically throughout plant startup. The catalytic recombiner is operated, and its operating characteristics are recorded. GRAB SAMPLES ARE TAKEN PERIODICALLY FOR RADIONUCLIDE ANALYSIS.

Acceptance Criteria - The release of GASEOUS AND airborne radioactive effluents does not exceed the limits specified in the technical specifications. The system measured variables are within acceptable limits of design. The catalytic recombiner, carbon beds, and filters perform properly.

(STP-32) Essential HVAC System Operation and Containment Hot Penetration Temperature Verification (Formerly SUT-34)

Test Objective - The test objective is to demonstrate, under actual operating conditions, satisfactory performance of the drywell, control enclosure, control room, reactor enclosure, and radwaste enclosure HVAC systems and to verify that concrete temperature surrounding hot penetrations remain within specified limits.

Prerequisites - Air flow balancing, cooling water balancing, and fuel loading are completed; power ascension testing is in progress.

Test Method - Air temperatures are monitored and recorded at NOMINAL 50 and 100 percent power. Space temperatures are not allowed to exceed predetermined maximum temperatures. Adjustments to air and/or cooling water flows are made, if required, to maintain temperature within specified limits. Concrete temperatures surrounding hot penetrations are monitored and recorded.

Acceptance Criteria - The drywell, control enclosure, control room, reactor enclosure, and radwaste HVAC systems provide adequate cooling, and concrete temperatures surrounding hot penetrations remain within specified limits.

(STP-36) Piping Dynamic Transient (Formerly SUT-36)

Test Objectives - The objective of this test is to verify the design adequacy of the piping systems for the transients indicated in Table 3.9-7.

Prerequisites - An engineering review of the piping system after construction is completed. The required preoperational tests have been completed, and the Station Superintendent has reviewed and approved the test procedures and initiation of testing. Instrumentation has been installed and calibrated.

Test Method - Response of the piping system (displacements or restraint loads) is measured during the transient event specified.

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TEST NO.	PROCEDURE DESCRIPTION	TEST CONDITION (1) OPEN VESSEL	HEAT UP	1	2	3	4	5	6	WARRANT
1	CHEMICAL AND RADIOCHEMICAL	X	X	X	X	X		X(6)	X	~~X~~
2	RADIATION MEASUREMENTS	X	X	~~X~~	X	X			X	
3	FUEL LOADING	X								
4	FULL CORE SHUTDOWN MARGIN		X (4)							
5	CONTROL ROD DRIVE SYSTEM	X	X		X	X			X	
6	SRM PERFORMANCE AND CONTROL ROD SEQUENCE		X (4)							
9	WATER LEVEL REFERENCE LEG TEMPERATURE		X	X	X	X	X	X	X	
10	IRM PERFORMANCE		X (4)	X						
11	LPRM CALIBRATION		X	X		X			X	
12	APRM CALIBRATION		X	X	X	X		X	X	X
13	PROCESS COMPUTER PERFORMANCE VERIFICATION	X	X	X	X	X			X (5)	
14	RCIC SYSTEM PERFORMANCE VERIFICATION		X	X	X (5,6)					
14.1	RCIC SYSTEM STARTUP AFTER LOSS OF AC POWER TO THE SYSTEM			X (6)						
14.2	RCIC SYSTEM OPERATION WITH A SUSTAINED LOSS OF AC POWER TO THE SYSTEM			X (6)						
15	HPCI SYSTEM PERFORMANCE VERIFICATION		X			X		~~X~~		
16	SELECTED PROCESS TEMPERATURES VERIFICATION		X			X	X		X	
17	SYSTEM EXPANSION	X	X		X (6)				X (6,8)	
18	TIP UNCERTAINTY					X			X	
19	CORE PERFORMANCE			X	X	X	X	X	X	X
20	STEAM PRODUCTION									
21	CORE POWER–VOID MODE RESPONSE						X	X		
22	PRESSURE REGULATOR RESPONSE			X	M	M	~~M~~ X	M	M	
23	FEEDWATER CONTROL SYSTEM DEMONSTRATION			X	X	X	X	X	X (5)	
24	MAIN TURBINE VALVES SURVEILLANCE TEST					X			X (5,9)	
25	MAIN STEAM ISOLATION VALVES PERFORMANCE VERIFICATION		X	X		X (3)		X (3)	X, SD (2,5,9)	
26	MAIN STEAM RELIEF VALVES PERFORMANCE		X		X					
27	TURBINE TRIP AND GENERATOR LOAD REJECTION DEMONSTRATION				X (7)	M, SD (2,5)			M, SD (2)	
28	SHUTDOWN FROM OUTSIDE THE MAIN CONTROL ROOM DEMONSTRATION				X, SD (2)					
29	RECIRCULATION FLOW CONTROL DEMONSTRATION				~~M~~	M (5)		~~M~~	M (5)	
30	RECIRCULATION SYSTEM				X	M	X		M	
31	LOSS OF TURBINE–GENERATOR AND OFFSITE POWER				X, SD					
32	ESSENTIAL HVAC SYSTEM OPERATION AND CONTAINMENT HOT PENETRATION TEMPERATURE VERIFICATION		X		~~X~~	X			X ~~(8)~~	
33	PIPING STEADY STATE VIBRATION		X		X	X (5)		X	X (5,6,8)	
34	OFFGAS SYSTEM PERFORMANCE VERIFICATION		X	X		X		~~X~~	X (5)	~~X~~
35	RECIRCULATION FLOW CALIBRATION				~~X~~	X (5)			X	
36	PIPING DYNAMIC TRANSIENT		X		X	X			X	
37	~~MAIN STEAM SYSTEM AND TURBINE PERFORMANCE AND PLANT DYNAMIC RESPONCE VERFICATION~~ DELETED				~~X~~	~~X~~		~~X~~	~~X~~	
38	DELETED									
70	REACTOR WATER CLEANUP SYSTEM PERFORMANCE VERIFICATION		X							
71	RESIDUAL HEAT REMOVAL SYSTEM PERFORMANCE VERIFICATION				X (6)				X (6,8)	

LEGEND

- X TEST INDEPENDENT OF FLOW CONTROLLER MODE
- M MASTER MANUAL FLOW CONTROLLER MODE
- SD SCRAM DEFINITE

NOTES

(1) SEE FIGURE 14.2-9 TEST CONDITION REGION MAP
(2) PERFORM TEST 5, TIMING OF 4 SLOWEST CONTROL RODS IN CONJUNCTION WITH THESE SCRAMS
(3) FULL CLOSURE OF ONE VALVE ONLY
(4) MAY BE DONE DURING TEST CONDITION OPEN VESSEL
(5) SOME TESTS DONE DURING APPROACH TO TEST CONDITION
(6) MAY BE DONE DURING AN EARLIER TEST CONDITION IF CONDITIONS WARRANT
(7) DONE WITH STEAM BYPASS CAPACITY
(8) SOME TESTS DONE AFTER PLANNED TRIPS FROM POWER
(9) DETERMINE MAXIMUM POWER LEVEL TEST CAN BE PERFORMED WITHOUT CAUSING REACTOR SCRAM

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FIGURE 14.2-5 REV. 3