PECO ENERGY

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January 11, 1995
CCN 96 14005

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Mail Station P1-137
Washington, DC 20555

Subject: Peach Bottom Atomic Power Station Unit No. 3 Report of Plant Startup Following The Tenth Refueling Outage

Gentlemen:

Enclosed is the Peach Bottom Atomic Power Station Startup Report for Unit No. 3 Cycle 11. The report is submitted pursuant to reporting requirement 6.9.1.a in Appendix A to Facility Operating License No. DPR-56.

Sincerely,

Gerald R. Rainey
Vice President,
Peach Bottom Atomic Power Station

GRR/RBW

Enclosure

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PECO ENERGY

PEACH BOTTOM ATOMIC POWER STATION

CYCLE 11
STARTUP REPORT
UNIT 3

SUBMITTED TO
THE U.S. NUCLEAR REGULATORY COMMISSION
PURSUANT TO
FACILITY OPERATING LICENSE DPR-56

DECEMBER
1995

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TABLES and FIGURES

EXECUTIVE SUMMARY

This Startup Test Report is submitted to the Nuclear Regulatory Commission (NRC) in accordance with the requirements of Peach Bottom Atomic Power Station (PBAPS) Technical Specification 6.9.1.a. The report summarizes the startup testing performed on PBAPS Unit 3 following the implementation of Power Rerate during the Fall 1995 Refueling Outage.

The result of Power Rerate is an increase in reactor power equal to 5% of the original rated thermal power. All testing identified within the PBAPS Updated Final Safety Analysis Report (UFSAR) Chapter 13.5 was addressed and evaluated for applicability to this increased licensed power rating as required by Technical Specifications.

The 18 day program began when the Reactor Mode Switch was placed in the Startup position on October 15, 1995. The unit was synchronized to the grid on October 17th, marking the official end to the Unit 3 10th refueling outage. The new rerated 100% power (3458 MWt) was first achieved on October 22, 1995. All required Rerate Startup Tests were completed by November 1, 1995.

Over 66 Rerate Startup Tests were performed satisfactorily during the startup. No programmatic Level 1 or Level 2 failures occurred. A total of two (2) Test Exception Reports (TERs) were initiated during the testing program for reasons other than program failures. TERs document unexpected or unsatisfactory conditions encountered during testing. All Test Exceptions were satisfactorily dispositioned. No further actions resulting from the TERs are required.

No adjustments were required to control systems for the following plant systems: EHC - Pressure Regulator, Feedwater, Recirculation, or Reactor Core Isolation Cooling (RCIC). Minor adjustments were made to the High Pressure Coolant Injection System (HPCI) control system. All systems performed in a stable manner during the plant startup and during transient testing. The unit is operating very well at rerated conditions.

1.0 Purpose

This Startup Test Report summarizes the testing performed on Peach Bottom Atomic Power Station (PBAPS) Unit 3 following the implementation of Power Rerate. The result of Power Rerate is an increase in reactor power equal to 5% of the original rated thermal power. All testing identified within the PBAPS Updated Final Safety Analysis Report (UFSAR) Chapter 13.5 was addressed and evaluated for applicability to this increased licensed power rating as required by Technical Specification 6.9.1.a. The Rerate Startup Test Program Plan documents these evaluations and describes in detail the testing performed for power rerate. Each test performed for power rerate is described herein, including the test purpose, description, acceptance criteria and results. This report is submitted in accordance with the requirements of Technical Specification 6.9.1.a.

2.0 Program Description

The power rerate startup testing requirements were developed primarily from the review of Chapter 13.5 of the PBAPS UFSAR, Section 10.3 of the GE Power Rerate Safety Analysis Report for Peach Bottom 2 & 3, and the GE Power Rerate Project Rerate Confirmation Test Program. The results of this testing determined the unit's ability to operate at the rerated power level. The testing was conducted following the 10^{th} refueling outage for Unit 3.

The majority of testing can be summarized into the following categories:

1) Verifying control systems (Feedwater, EHC - Pressure Regulator, and Recirculation) are stable at rerate conditions.

2) Verifying high pressure injection systems (Reactor Core Isolation Cooling, High Pressure Coolant Injection) operate acceptably at rerated pressures.

3) Data collection for comparison to original plant rated conditions and for use as a baseline for rerate conditions (Radiation surveys, Chemistry, Thermal Performance, Balance of Plant Steady State Data).

2.0 Program Description (Continued)

Test Conditions at which the testing was performed are defined below. All testing within a Test Condition must be completed prior to proceeding to the subsequent Test Condition. Reactor core flow can be any flow within the safe operating region of the power/flow map (Figure 1) that will produce the required power level.

Test Condition	Rerate Power Level	Rerate MWT
1	<85%	<2939
2	85%-86%	2939 - 2974
3	90%-91%	3112 - 3147
4	95%-96%	3285 - 3320
5	97%-98%	3354 - 3389
6	99%-100%	3423 - 3458

All testing within a Test Plateau must be completed and approved by the Rerate Startup Test Director and the Reactor Engineering Branch Head prior to increasing power to the subsequent Test Plateau. If a Level 1 failure occurs during testing, resolution and approval to increase power to the subsequent Test Plateau must be approved by PORC (Plant Operating Review Committee). No Level 1 failures occurred. Rerate Startup Test Plateaus are defined below.

Test Plateau A (≤91%) - Includes testing at Test Conditions 1, 2, & 3. Reactor thermal power cannot exceed 91%.

Test Plateau B (≤96%) - Includes Test Condition 4 testing. Reactor thermal power cannot exceed 96%.

Test Plateau C (≤98%) - Includes Test Condition 5 testing. Reactor thermal power cannot exceed 98%.

Test Plateau D (≤100%) - Includes Test Condition 6 testing. Reactor thermal power cannot exceed 100%.

3.0 Acceptance Criteria

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

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

Any acceptance criteria failure must be documented on a Test Exception Report (TER).

4.0 Rerate Startup Test Program Summary

The test program began when the Mode Switch was placed in Startup on October 15, 1995 and ended with all required Rerate Startup Tests complete on November 1, 1995. The unit was synchronized to the grid on October 17th, marking the official end to the Unit 3 10th refueling outage. The new rerated 100% power (3458 MWt) was first achieved on October 22, 1995.

In general, the unit operates very well at the rerated conditions. No adjustments were required to control systems for the following: EHC - Pressure Regulator, Feedwater, Recirculation, or Reactor Core Isolation Cooling (RCIC). Minor adjustments were made to the High Pressure Coolant Injection System (HPCI). All systems performed in a stable manner.

RCIC and HPCI achieved their respective rated flows and pressures well within the design time requirements at rerated pressure conditions. Minor adjustments were made to the HPCI speed control system while performing the HPCI Flow Control Stability Test at 100% power. Due to these adjustments, it was decided to rerun the HPCI Cold Quick Start test. HPCI again achieved rated flow and pressure well within the design time requirement of 30 seconds during the second run.

Data collected at rerated conditions showed that the 5% increase in reactor power has little, if any, effect on reactor water chemistry and radiological conditions throughout the plant.

4.0 Rerate Startup Test Program Summary (Continued)

All Rerate Startup Tests were performed satisfactorily during the startup from 3R10 refueling outage. Table 1 identifies all of the required Rerate Startup Tests and the Test Conditions in which each test was performed. No Level 1 or Level 2 failures occurred during the program. A total of two (2) Test Exception Reports (TERs) were initiated during the testing program for reasons other than program failure criteria. Brief descriptions of the two TERs are described below.

1. The SI for the RPS Card File Functional was not documented as completed during the outage. It was completed in normal frequency prior to the outage and changed from a monthly to a quarterly frequency. It was therefore not required to be performed during the outage. No changes to the card file were required by power rerate. All changes due to rerate for RPS were performed by instrument calibrations. All instrument calibration procedures were revised and performed.

2. While performing the RCIC Quick Start procedure at 950 psig, the process computer could not produce a Core Power and Flow Log via 3D Monicore. It was realized at this point that the 3D Monicore System did not have accurate data to produce the log at this low power level. Alternate indication was used to determine and document Reactor power level. There was no effect on test performance due to this change. All tests at this power level used the alternate indication for power level.

5.0 Chronology of Events

Event	Date/Time
Mode Switch to Startup (Test Condition 1)	**Oct 15/1445**
Shutdown Margin Demonstration - Cycle 11	Oct 15/2159
Feedwater Heater Level Controller Adjustments	Oct 16/0259
RCIC Operability (not a rerate test)	Oct 16/0359
Turbine Shell/Chest Warming	Oct 16/1559
HPCI Operability	Oct 16/0559
Raise EHC Pressure Set to 940 Psig	Oct 16/1359
Drywell Inspection	Oct 16/1459
Pull Control Rods until 4 BPV's Open	Oct 16/1559
Roll Main Turbine	Oct 17/0159
SP-2067 RCIC Quick Start & Stability	Oct 17/0259
Synchronize to Generator	Oct 17/0159
Increased Power to 20%	Oct 17/0259
SP-2071 HPCI Quick Start & Stability	Oct 17/0759
Increased Power to 25%	Oct 17/0359
SP-2084 Pressure Regulator Incremental Regulation	Oct 17/0436
SP-2075 Pressure Regulator Stability	Oct 17/0959
Rod Block Monitor Cal/Functionals	Oct 18/0459
SP-2080 Rerate I&C Surveillance Testing	Oct 18/0559
Control Rod Drive Scram Time Testing (approximately 40 hours)	Oct 19/2059

5.0 Chronology of Events (Continued)

Event	Date/Time
Increased Power to 29%	Oct 19/0759
APRM Calibration	Oct 19/1159
Recirc Pump 45% speed in-place cal	Oct 19/1459
Increased Power to 60%	Oct 19/2359
Perform OD-1 (TIP wiring and computer interface delay of 23 hrs & 43 min.)	Oct 21/0059
Increased Power to 75%	Oct 21/0259
SP-2073 MSIV Individual Closures	Oct 21/0359
CH-420 SJAE Off-Gas Sampling	Oct 21/0359
Increased Power to 85% (Test Condition 2)	**Oct 21/1359**
SP-2082 Steady State Data Collection	Oct 21/1459
APRM Calibration	Oct 21/1459
Increased Power to 90% (Test Condition 3)	**Oct 21/1559**
HP-C-200 Radiation Measurements	Oct 21/1759
SP-2079 Thermal Limits Evaluation	Oct 21/1759
APRM Calibration	Oct 21/1759
SP-2082 Steady State Data Collection	Oct 21/1959
SP-2077 Control Valve Surveillance Test	Oct 21/2259
SP-2076 Stop Valve Surveillance Test	Oct 21/2259
Test Plateau A Results Approved	Oct 21/2259
Increased Power to 95% (Test Condition 4)	**Oct 21/2359**
HP-C-200 Radiation Measurements	Oct 22/0159
Drywell Temperature Monitoring Test	Oct 22/0059
SP-2078 Thermal Performance Data	Oct 22/0359

5.0 Chronology of Events (Continued)

Event	Date/Time
APRM Calibration	Oct 22/0159
SP-2079 Thermal Limits Evaluation	Oct 22/0059
SP-2077 Control Valve Surveillance Test	Oct 22/0159
SP-2076 Stop Valve Surveillance Test	Oct 22/0159
SP-2081 Rerate Chemistry	Oct 22/0259
SP-2082 Steady State Data Collection	Oct 22/0259
Test Plateau B Results Approved	Oct 22/0359
Increased Power to 97% (Test Condition 5)	**Oct 22/0359**
SP-2076 Stop Valve Surveillance Test	Oct 22/0459
SP-2077 Control Valve Surveillance Test	Oct 22/0459
HP-C-200 Radiation Measurements	Oct 22/0559
APRM Calibration	Oct 22/0559
SP-2075 Pressure Regulator Stability	Oct 22/0559
SP-2082 Steady State Data Collection	Oct 22/0659
SP-2079 Thermal Limits Evaluation	Oct 22/0659
Dropped power to 86.6% due to loss of 220-34 Startup Feed. Power drop and recovery was via recirc flow	Oct 22/0759
SP-2074 Feedwater Stability	Oct 22/1159
Test Plateau C Results Approved	Oct 22/1259
Increased Power to 100% (Test Condition 6)	**Oct 22/1859**
HP-C-200 Radiation Measurements	Oct 22/2059
Drywell Temperature Monitoring Test	Oct 22/1959
SP-2082 Steady State Data Collection	**Oct 22/2059**
SP-2081 Rerate Chemistry	**Oct 22/2259**
SP-2079 Thermal Limits Evaluation	**Oct 22/2059**

5.0 Chronology of Events (Continued)

Event	Date/Time
Feedwater Heater Level Controller Adjustments	Oct 23/0259
SP-2076 Stop Valve Surveillance Test	Oct 23/0959
SP-2077 Control Valve Surveillance Test	Oct 23/1059
SP-2056 Containment Noise Monitoring	Oct 23/1340
RE-27 TIP Reproducibility	Oct 23/2159
Core Flow Verification	Oct 23/2259
LPRM Gain Calibration	Oct 24/0559
APRM Calibration	Oct 24/0659
Drop to 75% power via recirc flow	Oct 24/2100
Full power target rod pattern pattern set	Oct 24/2300
Unit back to 100% power	Oct 25/0500
SP-2068 RCIC Stability at Rerated Pressure	Oct 26/0559
SP-2072 HPCI Cold Quick Start	Oct 26/0559
SP-2070 HPCI Stability at Rerated Pressure	Oct 26/0559
SP-2069 RCIC Cold Quick Start	Oct 29/0959
SP-2078 Thermal Performance Data Collection (9 Day Soak Complete)	Nov 1/0800
Test Plateau D Results Approved	Nov 1/1000

TABLE 1 - Tests Performed for Power Rerate

#	Test Description	Test Condition					
		1	2	3	4	5	6
1	Chemical & Radiochemical				X		X
2	Radiation Measurements			X	X	X	X
4	Shutdown Margin	X					
5A	CRD Insert/Withdraw Times	X					
5B	CRD Scram Timing	X					
11	LPRM Calibration						X
12	APRM Calibration	X	X	X	X	X	X
14B	RCIC (> 920#)	X					
14C	RCIC Stability (Rerated Pressure)						X
14D	RCIC Cold Quick Start						X
15B	HPCI (> 920#)	X					
15C	HPCI Stability (Rerated Pressure)						X
15D	HPCI Cold Quick Start						X
18	Core Power Distribution						X
19	Core Performance			X	X	X	X
22	Pressure Regulator[1]	X				X	
23A	Feedwater Level Control	X				X	
25	Main Steam Isolacion valves	X					
33	Turbine Stop Valve ST			X	X	X	X
34	Turbine Control Valve ST			X	X	X	X
35	Recirc. System Flow Calibration						X
72	Drywell Atmospheric Cooling				X		X
80	Thermal Performance Test				X		X
81	I&C Surveillance Tests[2]	X					
82	Steady State Data Collection		X	X	X	X	X

1 -Pressure Regulator stability checks are performed at approximate rerate power levels of 25% and 97%

2 -These are to be performed prior to the plant condition for which the instrument is required to be operable.

FIGURE 1
Rerate Power/Flow Map

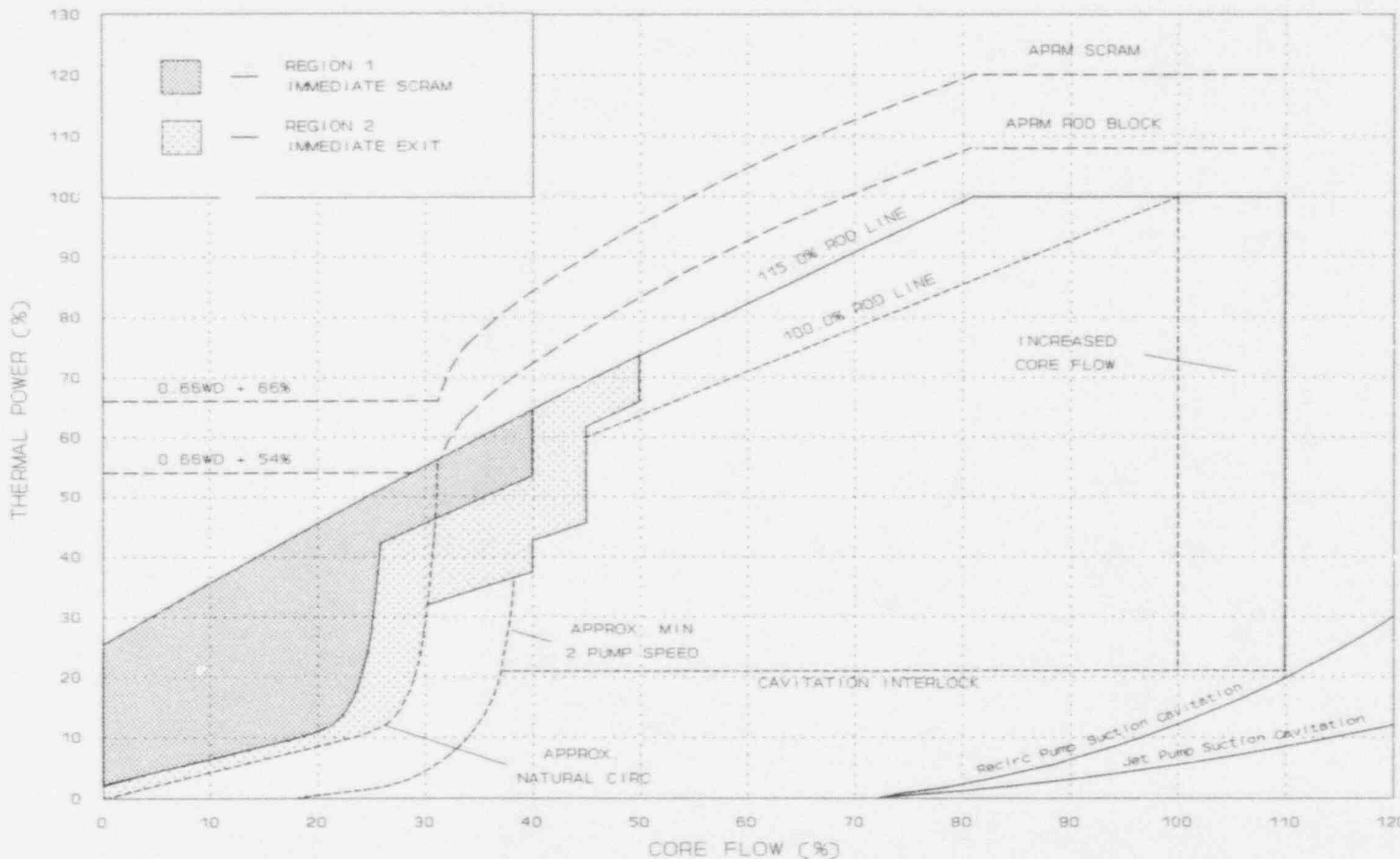
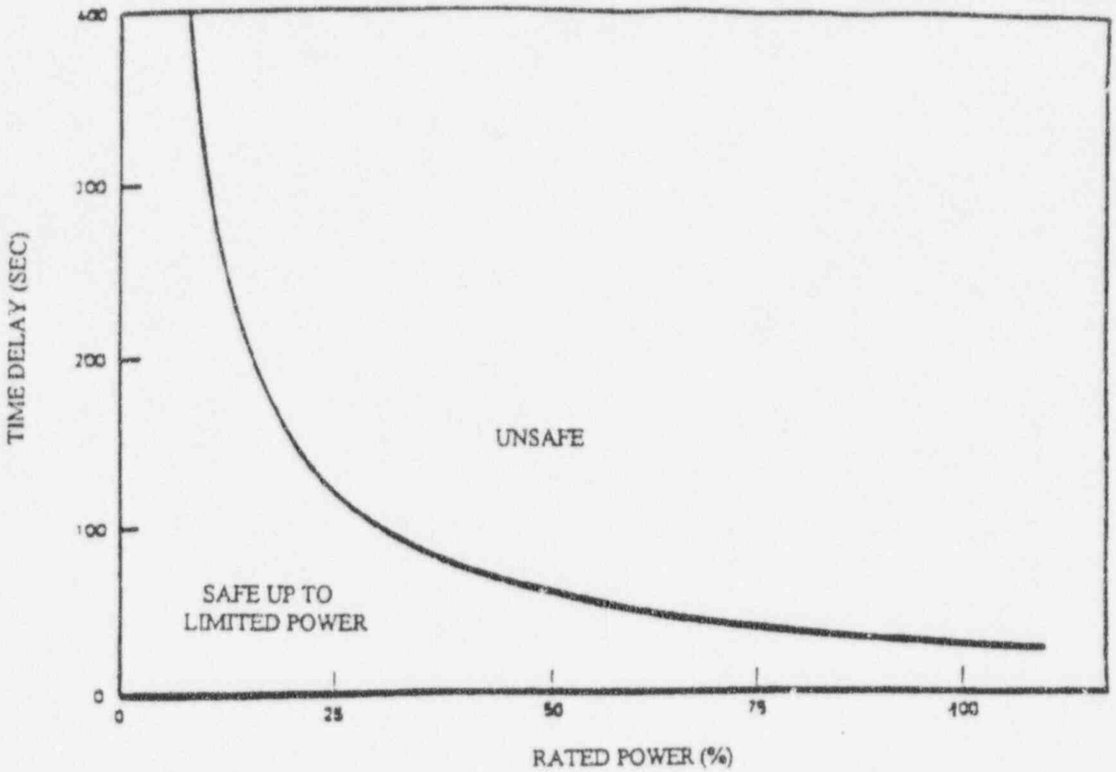
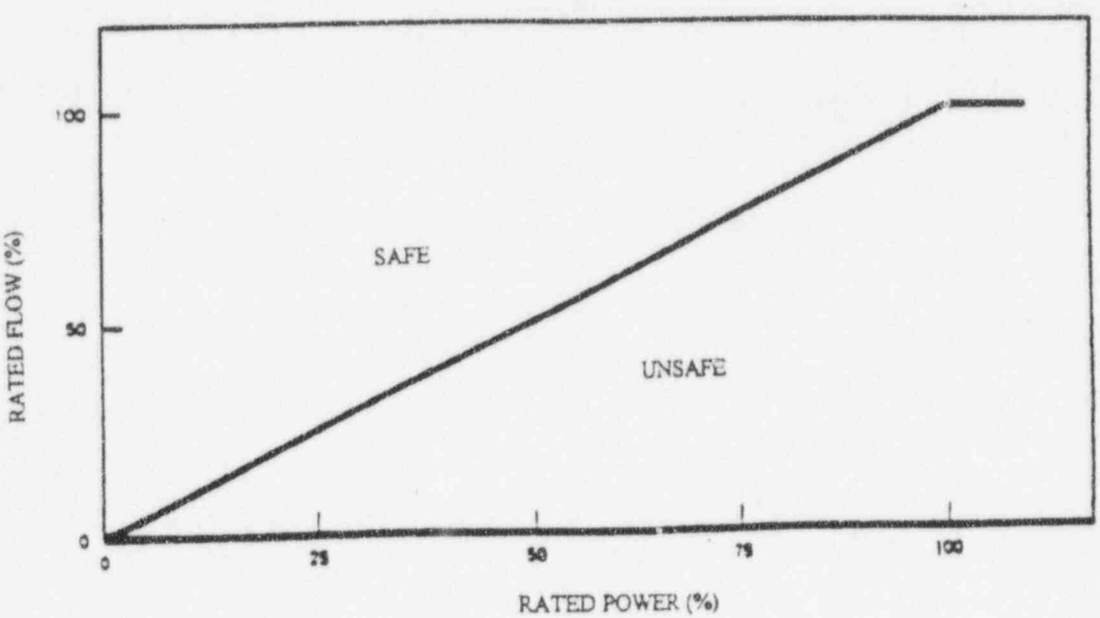


FIGURE 2
RCIC Acceptance Criteria Curves for Capacity and Actuation





6.0 Test Results Summaries

STARTUP TEST 1 - CHEMICAL AND RADIOCHEMICAL

Purpose

The primary objective of this test is to maintain control of and knowledge about the quality of the reactor coolant chemistry.

Description

Chemical and radiochemical samples are taken in accordance with the following plant procedures throughout power ascension to rerated conditions. Specific criteria evaluation for rerated conditions is performed in Special Procedure SP-2081 at the original 100% power level (Test Condition 4) and at the rerate 100% power level (Test Condition 6).

ST-C-095-819-3	ST-C-095-823-3
ST-C-095-864-3	ST-C-095-857-3
ST-C-095-859-3	ST-C-095-822-3
ST-C-095-825-3	ST-C-095-820-3

In addition, normal plant chemistry sampling is performed in accordance with CH-10. A Flag File Report, run at 95% (original 100%) and 100% rerate power, summarizes the chemistry data obtained, compares the values to plant requirements and flags any parameters which exceed their specific limit. If possible, carryover is determined at 95% and 100% using normally obtained grab samples. The Flag File data and the carryover determination are performed to obtain baseline data and have no acceptance criteria specifically associated with them.

Level 1 Criteria

1. Primary Reactor Coolant iodine dose equivalent I-131 concentration is less than or equal to 0.2 microcurie/gram.

2. Primary Coolant conductivity is less than or equal to 5.0 micromhos/cm at 25°C.

3. Primary Coolant chloride ion concentration is less than or equal to 200 ppb.

4. Noble gas release rate from the Steam Jet Air Ejector discharge shall not exceed 320,000 microcuries/second after a 30 minute decay.

5. Site Tech Spec Dose Rate < 100%.

Level 2 Criteria

None.

STARTUP TEST 1 - CHEMICAL AND RADIOCHEMICAL (Continued)

Results

Special Procedure SP-2081, Chemistry Rerate Information, was performed at 95% and 100% power levels. Samples were obtained and analyzed. All acceptance criteria were satisfied. The test results are shown in Table 1.1.

TABLE 1.1
Rerate Chemistry Results

Parameter	Actual Data (95%)	Actual Data (100%)	Acceptance Criteria
Primary Reactor Coolant Iodine	8.42×10^{-4}	7.406×10^{-4}	≤ 0.2μCI/gm
Primary Reactor Coolant Conductivity	0.099	0.093	≤ 5.0 μmhos/cm
Chloride Ion Concentration	1.7	1.336	≤ 200 ppb
Noble Gas Release Rate	8,475	12,252	≤ 320,000 μCi/sec
Noble Gas Dose Rate	< 30%	< 30%	< 100%

A Flag File Report was run at 95% and 100% rerate power which summarized the chemistry data obtained, compared the values to plant requirements and flagged any parameters which exceeded their specific limit. All flag file action codes were "500s" and therefore no actions were required.

Carryover was not able to be determined at 95% power since I-131 was not detected in the reactor water or condensate influent samples. Carryover was 4.8 at 100% power. Carryover is determined for baseline data only. There are no criteria associated with carryover.

In general, chemistry has not shown any significant changes due to power rerate.

STARTUP TEST 2 - RADIATION MEASUREMENTS

Purpose

This test measures radiation levels at selected locations and power conditions to assure the protection of plant personnel and continuous compliance with guideline standards of 10CFR20 during plant operation.

Description

Radiation levels are measured at various locations in the plant at rerated power levels of 90%, 95%, 98%, and 100% (Test Conditions 3, 4, 5, and 6, respectively) in accordance with HP-C-200.

Level 1 Criteria

Radiation doses of plant origin and occupancy times of personnel in radiation zones shall be controlled consistent with the guidelines of the standards for protection against radiation outlined in 10CFR20 NRC General Design Criteria.

Level 2 Criteria

None.

Results

Radiation surveys were conducted at rerated power levels of 90%, 95%, 98%, and 100% in accordance with HP-C-200. The results of these surveys are shown in Table 2.1. In addition, surveys were conducted during Reactor Core Isolation Cooling (RCIC), High Pressure Coolant Injection (HPCI), and Residual Heat Removal (RHR) system runs. These results are shown in Tables 2.2 and 2.3, respectively.

Essentially, the dose rates are the same as those experienced at the original 100% power. The Main Turbine Deck is the only area experiencing increased dose rates. No area postings were changed as a result of achieving the rerate 100% power level.

STARTUP TEST 2 - RADIATION MEASUREMENTS (Continued)

TABLE 2.1
Rerate Radiation Survey Results
(Dose Rates Recorded in mRem/Hour)

Plant Location	Rerate Power Level			
	90	95	97	100
Outside A SJAE	<2	<2	<2	<2
Outside B SJAE	<2	<2	<2	<2
Outside Mech Vac Pp Rm	<2	<2	<2	<2
Moisture Separator Area	440	500	600	600
4A FW Heater Room	10	14	12	10
4B FW Heater Room	30	38	36	36
4C FW Heater Room	6	6	8	8
TB Fan Room -El 195	<2	<2	<2	<2
A RFPT Room	150	180	180	200
B RFPT Room	140	160	160	180
C RFPT Room	140	150	160	160
5A FW Heater Room	80	100	100	120
5B FW Heater Room	80	80	100	100
5C FW Heater Room	60	80	80	80
TB El 165 General Area	<2	<2	<2	<2
Turbine Deck	400	460	480	600
Outside - Fence Area	<0.1	<.2	<.2	<.2
Drywell Equip. Hatch Door	1.0	1.0	1.0	1.0
TIP Room Door	0.3	0.4	0.4	0.4
Drywell Personnel Airlock	8.0	10	10	10

STARTUP TEST 2 - RADIATION MEASUREMENTS (Continued)

TABLE 2.2
Radiation Surveys During RCIC and HPCI System Runs

Plant Location	Rerate Power Level = 100%	
	RCIC System Run	HPCI System Run
RCIC Room	40-60mrem/hr	<2mrem/hr
HPCI Room	NA	44 mrem/hr
Torus Room	5-140mrem/hr	4-300 mrem/hr
North Isolation Valve Room	NA	6-200 mrem/hr
South Isolation Valve Room	NA	2-12 mrem/hr

STARTUP TEST 4 - SHUTDOWN MARGIN

Purpose

This test demonstrates that the reactor will be subcritical by at least 0.38% (delta K)/K throughout the fuel cycle with any single control rod fully withdrawn.

Description

Shutdown margin demonstration is performed in accordance with ST-R-002-910-3, Shutdown Margin, during Test Condition 1.

Level 1 Criteria

Shutdown margin is ≥0.38% (delta K)/K + R.

Level 2 Criteria

None.

Results

For Unit 3 Cycle 11, the required shutdown margin must be greater than 0.38% (delta K)/K + R, where R is equal to 0.960% (delta K)/K. Therefore, the calculated shutdown margin for Cycle 11 must be greater than 1.340% (delta K)/K.

As Unit 3 reached criticality, data was collected to calculate Shutdown Margin in accordance with ST-R-002-910-3, Shutdown Margin (Unit 3 - Cycle 11). Cycle 11 shutdown margin was determined to be 1.9% (delta K)/K. This satisfies the Level 1 Acceptance Criteria.

STARTUP TEST 5A - CONTROL ROD DRIVES - Insert/Withdraw Timing

Purpose

This testing demonstrates that the control rods meet Technical Specification requirements for RPIS full in, RPIS full out, and uncoupling checks.

Description

Control rod insert/withdraw timing is conducted during Test Condition 1 in accordance with ST-O-003-465-3, Control Rod Withdraw Tests.

Level 1 Criteria

RPIS Full in, RPIS Full out, and uncoupling checks are completed satisfactory for all control rods.

Level 2 Criteria

Insert and withdraw stroke times correlate to 3 inches per second or one position per second.

Results

All control rods were stroked and couple checked in accordance with ST-O-003-465-3. Level 1 Acceptance Criteria was satisfied for all control rods. RT-O-003-990-3, Control Rod Speed Adjustment, was used to stroke time the control rods that maintenance was performed on or rods that operators visually appeared to be slow or fast. Rods that were determined to be slow or fast were adjusted via the directional control valve needle valve. After the adjustments, the rod speeds were acceptable. Therefore, the Level 2 criteria was met prior to startup and no Test Exception Report was required.

STARTUP TEST 5B - CONTROL ROD DRIVES - Scram Timing

Purpose

This testing demonstrates that the control rods meet Technical Specification requirements for scram times.

Description

Scram timing of control rods is performed during Test Condition 1 in accordance with ST-R-003-460-3, CRD Scram Insertion Timing, Full In and Full Out Position Indication Check, and Rod Coupling Integrity Check For All Operable Control Rods.

Level 1 Criteria

1. The total average 5% scram time is less than or equal to 0.375 seconds.

2. The total average 20% scram time is less than or equal to 0.90 seconds.

3. The total average 50% scram time is less than or equal to 2.0 seconds.

4. The total average 90% scram time is less than or equal to 3.5 seconds.

5. The average 5% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array is less than or equal to 0.398 seconds.

6. The average 20% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array is less than or equal to 0.954 seconds.

7. The average 50% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array is less than or equal to 2.120 seconds.

8. The average 90% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array is less than or equal to 3.8 seconds.

9. Insertion time to 90% of all operable control rods is less than or equal to 7.00 seconds.

Level 2 Criteria

None.

STARTUP TEST 5B - CONTROL ROD DRIVES - Scram Timing (Continued)

Results

Scram timing was performed for all control rods. All Level 1 Acceptance Criteria were satisfied. Test results are shown in Table 5B.1. Test results for the average scram insertion times for the three fastest rods of all groups of four control rods in a two by two array are given as the most limiting time for the two by two arrays. The acceptance criteria, as defined above, is adjusted within the test procedure to account for the difference between actual notch location and percentage of rod insertion. The adjusted acceptance criteria is shown below with the test results.

TABLE 5B.1
CRD Scram Timing Results

Scram Time Description	Acceptance Criteria (Seconds)	Test Results (Seconds)
Total Average 5% scram time	≤ 0.359	0.346
Total Average 20% scram time	≤ 0.92	0.743
Total Average 50% scram time	≤ 1.99	1.490
Total Average 90% scram time	≤ 3.67	2.628
Average 5% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array	≤ 0.382	0.369
Average 20% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array	≤ 0.974	0.782
Average 50% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array	≤ 2.110	1.561
Average 90% scram insertion times for the three fastest control rods of all groups of four control rods in a two by two array	≤ 3.970	2.730

STARTUP TEST 11 - LPRM CALIBRATION

Purpose

The purpose of this test is to calibrate the local power range monitors (LPRMs).

Description

The LPRM channels are calibrated to make the LPRM readings proportional to the neutron flux in the narrow-narrow water gap at the chamber elevation. This calibration is performed in accordance with ST-I-60A-230-3 LPRM Gain Calibration, during Test Condition 6.

Level 1 Criteria

All operable LPRM values are within ±2 absolute value points of the last P-1 LPRM RCAL (Calibrated LPRM Readings) values.

Level 2 Criteria

None.

Results

Using the Plant Monitoring System (PMS) and 3-D Monicore System, all operable LPRMs were successfully calibrated. All operable LPRM raw readings were within ±2 absolute value points of the last P-1 Calibrated LPRM values. LPRM Gain Adjustment Factor (GAFT) values for all operable LPRM channels were greater than or equal to 0.95 and less than or equal to 1.05, as required.

STARTUP TEST 12 - APRM CALIBRATION

Purpose

The purpose of this test is to calibrate the average power range monitors (APRMs).

Description

Each APRM channel reading is adjusted to be consistent with the incidated core thermal power. This calibration is performed as necessary during power ascension in accordance with ST-O-60A-210-3, APRM System Calibration During Two Loop Operation, or RT-R-60A-210-3, APRM Gain Adjustment.

Level 1 Criteria

APRMs are correctly set to calculated APRM setting.

Level 2 Criteria

None.

Results

APRM Calibrations or Gain Adjustments were performed during each Test Condition (1 through 6) during the Rerate Startup Test Program to ensure the following:

1. The APRMs were correctly set to the calculated APRM setting.

2. The corresponding APRM gain adjustment factors (AGAF) values on the 3D MONICORE P1 edit are ≤ 1.00.

Each performance of ST-O-60A-210-3, APRM System Calibration During Two Loop Operation, and RT-R-60A-210-3, APRM Gain Adjustment, was completed satisfactorily. No problems were encountered during these tests.

STARTUP TEST 14 - REACTOR CORE ISOLATION COOLING SYSTEM

Purpose

This testing verifies proper operation of the Reactor Core Isolation Cooling (RCIC) System at the rerate operating pressure and provides baseline data for future surveillance testing. This testing is separated into three subtests (Startup Test Instructions, STI-14B, -14C, and -14D). Data obtained during the rated pressure quick start test is analyzed to verify the margin to trip on RCIC Turbine Speed following a quick start to satisfy SIL 377 commitment.

Description

STI-14B

Using the current controller settings, RCIC is operated in the CST to CST mode with reactor pressure between 920 psig and 1000 psig to demonstrate acceptable operation at the lower end of the operating pressure range for power rerate and to provide a benchmark to which future surveillance tests are compared. This demonstration is performed using ST-O-013-301-3, RCIC Pump, Valve, Flow and Unit Cooler Functional and In-Service Test, and Special Procedure SP-2067. A stability check of the RCIC system is also performed during this test by introducing small flow steps following the system quick start.

STI-14C

System stability at 100% rerated operating pressure shall be demonstrated by introducing small step disturbances in flow demand in accordance with RT-X-013-230-3 and Special Procedure SP-2068. Additionally, the RCIC Pump, Valve, Flow and Unit Cooler Functional and In-Service was performed.

STI-14D

A cold quick start is performed in accordance with RT-O-013-725-3, RCIC Response Time Test and Special Procedure SP-2069 at 100% rerate power. As part of the analysis of the RCIC cold quick start at rerated conditions, the margin to trip on RCIC turbine speed is measured to determine if the recommended modification of GE SIL 377 is needed.

STARTUP TEST 14 - RCIC SYSTEM (Continued)

Level 1 Criteria

1. The system shall deliver rated flow (600 gpm) in less than or equal to the amount of time defined by the curve in Figure 2 from the automatic initiation at any reactor pressure between 150 psig and rated pressure at rerate conditions.

2. The RCIC turbine shall not trip or isolate during auto or manual starts.

   NOTE: If any Level 1 criteria are not met, the reactor will only be allowed to operate up to a restricted power level defined by Figure 2 until the Level 1 criteria are met. Consult Technical Specifications for other actions to be taken.

Level 2 Criteria

1. To provide an overspeed and isolation trip avoidance margin, the transient start first and subsequent speed peaks shall not be more than 5% faster than rated RCIC turbine speed. (Peak speed ≤ 4777.5 rpm)

2. The speed and flow control loops shall be adjusted so that the decay ratio of any RCIC system related variable is less than 0.25.

3. Turbine gland seal condenser system shall be capable of preventing steam leakage to the atmosphere.

Results

STI-14B

With reactor pressure at approximately 954 psig, RCIC system stability was verified by introducing a 400 rpm speed decrease step followed by a 400 rpm speed increase step. Plots of the step inputs showed good system response. No controller adjustments were required. Then a 60 gpm flow increase and a 60 gpm flow decrease was introduced. As before, no controller adjustments were required. The RCIC Pump, Valve, Flow and Unit Cooler Functional passed with no actions required.

Following these tests, RCIC was shut down, and a quick start was performed. RCIC achieved rated flow of 600 gpm in 21.8 seconds with a pump discharge pressure of 1275 psig. All Level 1 and Level 2 acceptance criteria were satisfied.

STARTUP TEST 14 - RCIC SYSTEM (Continued)

STI-14C and STI-14D

At approximately 99.7% rerated reactor power and 1029 psig reactor pressure, a RCIC cold quick start was initiated. Rated flow (600 gpm) was attained in 17.1 seconds with a pump discharge pressure of 1312 psig. Peak RCIC turbine speed during the quick start was 4550 rpm. All Level 1 and Level 2 acceptance criteria were satisfied. Based on the acceptable RCIC speed peaks during the quick start at rerated conditions, the modification recommended by GE SIL 377 is not required.

Immediately following the cold quick start at rated conditions, RCIC system stability was checked. RCIC system stability was verified by introducing a 400 rpm speed decrease step followed by a 400 rpm speed increase step. Plots of the step inputs showed good system response. No controller adjustments were required. Then, a 60 gpm flow decrease and a 60 gpm flow increase were introduced. As before, no controller adjustments were required. The RCIC Pump, Valve, Flow and Unit Cooler Functional passed with no actions required.

STARTUP TEST 15 - HIGH PRESSURE COOLANT INJECTION SYSTEM

Purpose

This test verifies proper operation of the High Pressure Coolant Injection (HPCI) System at the rerate operating pressure and provides baseline data for future surveillance testing. This testing is separated into three subtests (Startup Test Instructions, STI-15B, -15C, and -15D).

Description

STI-15B

Using the current controller settings, HPCI is operated in the CST to CST mode with reactor pressure between 920 psig and 1000 psig to demonstrate acceptable operation at the lower end of the operating pressure range for power rerate and to provide a benchmark to which future surveillance tests are compared. This demonstration will be performed using ST-O-023-301-3, HPCI Pump, Valve, Flow and Unit Cooler Functional and In-Service Test and Special Procedure SP-2071. A stability check of the HPCI system is also performed by introducing small flow steps following the system quick start.

STI-15C

System stability at rerated operating pressure shall be demonstrated by introducing small step disturbances in flow demand in accordance with RT-X-023-210-3 and Special Procedure SP-2070.

STI-15D

A cold quick start is performed in accordance with RT-O-023-725-3, HPCI Response Time Test and Special Procedure SP-2072 at 100% rerate power.

Level 1 Criteria

1. The system shall deliver rated flow (5000 gpm) in less than or equal to 30 seconds from the automatic initiation at any reactor pressure between 150 psig and rated pressure at rerate conditions.

2. The HPCI turbine shall not trip or isolate during auto or manual starts.

STARTUP TEST 15 - HIGH PRESSURE COOLANT INJECTION SYSTEM (Continued)

Level 2 Criteria

1. To provide an overspeed and isolation trip avoidance margin, the transient start first speed peak shall not be within 15% (of rated turbine speed) of the overspeed trip, and subsequent speed peaks shall not be more than 5% faster than rated HPCI turbine speed.

2. The speed and flow control loops shall be adjusted so that the decay ratio of any HPCI system related variable is not greater than 0.25.

3. Turbine gland seal condenser system shall be capable of preventing steam leakage to the atmosphere.

Results

STI-15B

With reactor pressure at approximately 947 psig, HPCI system stability was verified by introducing a 400 rpm speed decrease followed by a 400 rpm speed increase. Plots of the speed changes showed good system response. No controller adjustments were required. Following the speed changes, a 500 gpm negative flow step followed by a 500 gpm positive flow step. Plots of the step inputs showed good system response. No controller adjustments were required.

Following the stability check, HPCI was shut down, and a quick start was performed. HPCI achieved rated flow of 5000 gpm in less than 30 seconds. The transient start first turbine speed peak was 2650 rpm. The second and only subsequent speed peak was 3300 rpm. Both speed peaks satisfied the acceptance criteria requiring peak speeds to be less than or equal to 4385 rpm and 4305 rpm, respectively. All Level 1 and Level 2 acceptance criteria were satisfied.

STARTUP TEST 15 - HIGH PRESSURE COOLANT INJECTION SYSTEM (Continued)

STI-15C and STI-15D

On October 22, 1995 at approximately 99.2% rerated reactor power and 1032 psig reactor pressure, a HPCI cold quick start was initiated. Rated flow (5000 gpm) was attained in less than 30 seconds. All speed peaks were less than their respective acceptance criteria. This test was reperformed after greater than 72 hours due to controller adjustments made during the stability check. Greater detail is provided in the second cold quick start description following the initial stability check description.

Immediately following the cold quick start at rated conditions, HPCI system stability was checked. HPCI system stability was verified by introducing a 400 rpm speed decrease followed by a 400 rpm speed increase. Plots of the speed changes were analyzed and indicated minor EGR changes were necessary. Following the EGR adjustments, the same speed changes were introduced and a 500 gpm flow decrease and a 500 gpm flow increase were introduced. Plots of these changes showed good system response and no further adjustments were necessary. Even though the initial cold quick start passed the acceptance criteria, due to the controller adjustments during the initial stability test, the system was then shut down for at least 72 hours to reperform the cold quick start.

On October 26, 1995 at approximately 99.8% rerated reactor power and 1029 psig reactor pressure, the HPCI cold quick start was reperformed. Rated flow of 5000 gpm was attained in 22.6 seconds with a pump discharge pressure of 1312.5 psig. The initial speed peek was 750 rpm. There was no additional speed peek and speed ramped smoothly to 3750 rpm. The speed peek was well below the acceptance criteria of 4385 rpm. The stability test was reperformed with the same speed and flow changes. Plots of these changes showed good system response. No adjustments were required. The HPCI Pump, Valve, Flow and Unit Cooler Functional was performed with ST-O-023-301-3. All ST requirements were met.

STARTUP TEST 18 - CORE POWER DISTRIBUTION

Purpose

This test confirms both the reproducibility of the traversing incore probe system (TIPS) readings and core power distribution symmetry.

Description

This test is performed at Test Condition 6 in accordance with RE-27, Core Power Symmetry and TIP Reproducibility, and FM-UG-412, Analysis of Total TIP Uncertainty Using NSTIP.

Level 1 Criteria

None.

Level 2 Criteria

1. The Total TIP uncertainty is < 7.1%.

2. The TIP traces shall be reproducible within 3.5% relative error.

Results

At approximately 99.3% power, reactor power distribution data was collected by repeatedly traversing the core axially with gamma TIPs. The data was subsequently processed by the Plant Monitoring System computer programs and 3D Monicore and transmitted to the Fuel & Services Division for analysis. Results of the analysis determined the maximum total TIP uncertainty to be 2.248% which satisfies the requirement to be less than 7.1%. The TIP traces were found to be reproducible within 3.5% relative error. All acceptance criteria were satisfied.

STARTUP TEST 19 - CORE PERFORMANCE

Purpose

This test evaluates the core performance parameters to assure plant thermal limits are maintained during the ascension to rerate conditions.

Description

As power is increased along a constant rod pattern line, core thermal power will be measured near 90% (Test Condition 3), 95% (Test Condition 4), 97% (Test Condition 5), and at 100% rerate power (Test Condition 6), using the current plant methods of monitoring reactor power.

Demonstration of fuel thermal margin is performed prior to, during and following power ascension to each power level up to the rerated 100% power. Fuel thermal margin is projected for the next test point to confirm acceptable margin, and is satisfactorily verified by the measurements taken at each test point before advancing to the next increment.

This on-going monitoring of fuel conditions is performed in accordance with RE-31, Reactor Engineering Core Monitoring Instructions and Special Procedure SP-2031, Core Performance Thermal Limits Evaluation.

Level 1 Criteria

The following thermal limits are ≤ 1.000:

1. Maximum MFLPD (Core Maximum Fraction of Limiting Power Density)
2. Maximum MFLCPR (Core Maximum Fraction of Limiting Critical Power)
3. Maximum MAPRAT (Core Maximum Average Planar Linear Heat Generation Rate Ratio)
4. FLLLP (Fraction of Load Line Limit Power

Level 2 Criteria

None.

STARTUP TEST 19 - CORE PERFORMANCE (Continued)

Results

Using the Plant Monitoring System (PMS) computer and 3D Monicore, data was obtained to project fuel thermal margin at each subsequent test condition and to evaluate thermal limits at each test condition corresponding to approximate reactor power levels of 90%, 95%, 97%, and 100%. The results at each test condition are shown in Table 19.1. All acceptance criteria were satisfied.

TABLE 19.1
Core Performance - Thermal Limits Evaluation Results

Thermal Limit	Rerate Power Level			
	90%	95%	97%	100%
MFLCPR ≤ 1.000	0.956	0.945	0.941	0.975
MFLPD ≤ 1.000	0.885	0.932	0.942	0.922
MAPRAT ≤ 1.000	0.930	0.945	0.944	0.912
FLLLP ≤ 1.000	0.894	0.858	0.856	0.923

STARTUP TEST 22 - PRESSURE REGULATOR

Purpose

This test has three objectives.

1. To confirm the adequacy of the settings for the pressure control loop by analysis of the transients induced in the reactor pressure control system by means of the pressure regulators.

2. To demonstrate the backup capability of the pressure regulators via simulated failure of the controlling pressure regulator.

3. To demonstrate that other affected parameters are within acceptable limits during pressure induced transient maneuvers.

Description

At approximate power levels of 25%, and 97% (Test Conditions 1, and 5), the following step inputs (approximate values) will be made to the controlling pressure regulator:

1. -3 psi
2. +3 psi
3. -5 psi
4. +5 psi
5. -10 psi
6. +10 psi

When this testing is complete for one pressure regulator, transfer is made to the other pressure regulator, and the steps shall be repeated. Simulated failure of each pressure regulator, while in control, is then performed to demonstrate the backup pressure regulator capability. Transfer between pressure regulators by normal transfer and by simulated failure demonstrate that these events are survivable and well-behaved. The step inputs and failover testing is performed in accordance with Special Procedure SP-2075.

Total steam flow and pressure regulator output data is taken in increments of 5% power during the power ascension from 25% to 85% rerated power and in increments of 2% from 85% to 100% rerate power. The variation in the slope of the curve plotted on linear graph paper (pressure regulator output versus total steam flow) must show that the incremental regulation is within the criteria. If the requirements are not met, the control valve function generator break points will have to be adjusted. Incremental regulation is determined in accordance with Special Procedure SP-2084.

STARTUP TEST 22 - PRESSURE REGULATOR (Continued)

Level 1 Criteria

The transient response of any pressure control system related variable to any test input must not diverge.

Level 2 Criteria

1. Pressure control system related variables may contain oscillatory modes of response. In these cases, the decay ratio for each controlled mode of response must be less than or equal to 0.25. (This criterion does not apply to tests involving simulated failure of one regulator with the backup regulator taking over.)

2. The pressure response time from initiation of pressure setpoint change to the turbine inlet pressure peak shall be ≤ 10 seconds.

3. Pressure control system deadband, delay, etc., shall be small enough that steady state limit cycles (if any) shall produce steam flow variations no larger than +0.5% of rated steam flow.

4. The peak neutron flux and/or peak vessel pressure shall remain below the scram settings by 7.5% and 10 psi respectively for all pressure regulator transients.

5. The variation in incremental regulation (ratio of the maximum to the minimum value of the quantity, "incremental change in pressure control signal/incremental change in steam flow", for each flow range) shall meet the following:

% of Steam Flow Obtained With Valves Wide Open	Variation
0 to 85%	≤ 4:1
85% to 97%	≤ 2:1
85% to 99%	≤ 5:1

Results

Pressure Regulator Stability

Pressure Regulator Stability testing was performed at rerate power levels of 24%, 97.9%. The data obtained during each test condition is summarized in Tables 22.1 and 22.2. The system response to all size step changes at each power level was excellent. There were no signs of process divergence or oscillations. Pressure response time and margins to scram setpoints were satisfactory in all cases. No limit cycles were observed. All Level 1 and Level 2 acceptance criteria applicable to the stability testing were satisfied.

STARTUP TEST 22 - PRESSURE REGULATOR (Continued)

Results (Continued)

Pressure Regulator Stability

Pressure Regulator failovers were performed at rerate power levels of 24% and 97.9%. The data obtained during each test condition is summarized in Tables 22.3 and 22.4. In all cases, the backup pressure regulator took control when the controlling regulator was failed. All acceptance criteria were satisfied.

Pressure Regulator Incremental Regulation Determination

Pressure Regulator Controller Output and steam flow data was collected approximately every 5% increase power from 25% to 85% power. From 85% power to 100% power the data was taken every 2% power increase. This data was used to calculate the pressure regulator incremental regulation. Experience gained from Unit 2 indicated that data below 25% power was not valid due to plant configurations (i.e., turbine not on line, bypass valve jack open signal). Therefore, 25% power was chosen as the starting point.

Data taken for this test was valid and calculations showed that the variation in incremental regulation satisfied the acceptance criteria for each steam flow range.

STARTUP TEST 22 - PRESSURE REGULATOR (Continued)

TABLE 22.1

	'A' PRESSURE REGULATOR STEP CHANGE DATA				
Rerate Power Level	Step Size (+/-)	Peak Pressure (psig)	Pressure Response Time	Peak Power (%)	Steady State Cycles
23.5%	-3	937	3.4	23.58	0
	+3	937.5	4.5	23.58	0
	-5	935.0	3.3	23.4	0
	+5	940	3.3	28.1	0
	-10	935	3.6	21.9	0
	+10	948	3.4	29.7	0
97.9%	-3	1025	<4	96.0	0
	+3	1031	<4	98.5	0
	-5	1023	<4	99.0	0
	+5	1033	<4	100	0
	-9	1020	<4	94.0	0
	+9	1038	<4	101	0

STARTUP TEST 22 - PRESSURE REGULATOR (Continued)

TABLE 22.2

	'B' PRESSURE REGULATOR STEP CHANGE DATA				
Rerate Power Level	Step Size (+/-)	Peak Pressure (psig)	Pressure Response Time	Peak Power (%)	Steady State Cycles
23.5	-3	940	3.7	24.2	0
	+3	948	3.1	27.3	0
	-5	938	3.5	23.4	0
	+5	948	3.4	28.1	0
	-10	935	3.7	21.9	0
	+10	948	3.5	28.9	0
97.9	-3	1026	<4	96.5	0
	+3	1030	<4	98.5	0
	-5	1023	<4	95.0	0
	+5	1033	<4	100	0
	-10	1021	<4	93.5	0
	+10	1036	<4	101.5	0

STARTUP TEST 22 - PRESSURE REGULATOR (Continued)

TABLE 22.3
Pressure Regulator 'B' Failed

	PRESSURE REGULATOR FAILOVER DATA				
Rerate Power Level	Step Size (psi)	Peak Pressure (psig)	Pressure Response Time	Peak Power (%)	Steady State Cycles
24%	3	955	<.5	32.8	2
97%	3	1035	<4	104	1

TABLE 22.4
Pressure Regulator 'A' Failed

	PRESSURE REGULATOR FAILOVER DATA				
Rerate Power Level	Step Size (psi)	Peak Pressure (psig)	Pressure Response Time	Peak Power (%)	Steady State Cycles
24%	3	955	<.5	33.6	2
97%	3	1035	<4	104	1

TABLE 22.5
Incremental Regulation Determination (Spreadsheet Calculation)

Steam Flow Range	Incremental Regulation		Variation Max/Min	Level 2 Criteria
	Maximum	Minimum		
0% to 85%	1.09	0.645	1.69	≤ 4:1
85% to 97%	1.44	0.769	1.87	≤ 2:1
85% to 99%	n/a*	m/a*	n/a*	≤ 5:1

*Steam flow as defined in the test is in percent of valves wide open. Percent of steam flow did not exceed 91.2%. Valves wide open condition will not be achieved during operation; therefore, the values provided from 85% to 97% covers the full range of power operating conditions for steam flow as expressed in % valves wide open.

STARTUP TEST 23 - FEEDWATER SYSTEM - Water Level Setpoint Changes

Purpose

This test verifies that the feedwater system has been adjusted to provide acceptable reactor water level control at rerated conditions.

Description

During the 3R10 outage, speed regulation tests are performed on the A, B, and C reactor feedwater pumps in accordance with RT-B-06D-201-3, RT-B-06D-202-3, and RT-B-06D-203-3 to determine the variation in speed regulation between the three pumps.

Reactor water level setpoint changes of approximately 3 to 6 inches are used to evaluate and acceptably adjust, if necessary, the feedwater control system settings for power and feedwater pump modes tested. The level setpoint changes are performed in accordance with RT-I-006-230-3, Feedwater Control System Stability Response Test, and Special Procedure SP-2074. Due to the ARTS/MELLA modifications having been installed in the previous outage (3R09), level setpoint changes are performed at 97% power only. This change from Unit 2 was discussed with and agreed to by GE.

Level 1 Criteria

The transient response of any level control system related variable to any test input shall not diverge.

Level 2 Criteria

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

2. At steady state generation for the 3/1 element systems, the input scaling to the mismatch gain shall be adjusted such that level error due to biased mismatch gain output shall be within ± 1 inch.

3. The variation in incremental regulation (ratio of the maximum to the minimum value of the quantity "incremental change in feedwater control signal divided by incremental change in feedwater flow") does not exceed a factor of 2 to 1.

4. The turbine speed regulation variation between the three feedpumps must match within ± 6% of rated speed.

STARTUP TEST 23 - FEEDWATER - Water Level Setpoint Changes (Continued)
Results

Speed Regulation

Speed regulation tests were performed on the A, B, and C reactor feedwater pumps during the 3R10 outage. The test procedures contain more conservative criteria than the GE acceptance criteria identified above. Individual feedpump turbine speed regulation must be 6% ± 0.5%, and the turbine speed regulation variation between the three feedwater pumps must match within ±1.0%. All acceptance criteria contained in the RT were satisfied.

TABLE 23.1
Reactor Feedwater Pump Turbine Speed Regulation

	RT-B-06D-201-3	RT-B-06D-202-3	RT-B-06D-203-3
RFPT	A RFPT	B RFPT	C RFPT
%	5.9	5.7	5.9
RPM/In.	63.40	61.23	64.29

Feedwater Stability

Feedwater Stability testing was conducted at 96.7%. Six inch level setpoint changes were input and system response was monitored. System response was not oscillatory and showed no signs of divergence. No system adjustments were required. All acceptance criteria related to system stability were satisfied.

The level error between single and three element level control was also verified following the stability testing. At steady state conditions, reactor water level was monitored as the Feedwater Level Control System was swapped from single element control to three element control and back to single element control.

There was no noticeable change in reactor water level; therefore, no adjustments to the mismatch gain were necessary. The acceptance criteria was satisfied.

STARTUP TEST 25 - MAIN STEAM ISOLATION VALVES

Purpose

This test functionally checks each MSIV for proper operation and measures each valve's closure time. This test also demonstrates that closure of an MSIV at the normal surveillance test power level (≤75%) will not cause a reactor scram at rerate conditions.

Description

Individual fast closure of each MSIV is performed in accordance with ST-O-07G-470-3, Main Steam Isolation Valve Closure Timing and Continuity Test, and Special Procedure SP-2073, at approximately 75% power. Because a significant margin to scram at 71% power was demonstrated in the Unit 2 startup program, the MSIVs were not tested at this conservative power level on Unit 3.

Level 1 Criteria

1. MSIV stroke time shall be between 3 and 5 seconds.

Level 2 Criteria

1. Reactor pressure must be 20 psi below scram.
   (Peak pressure ≤ 1065 psig)

2. Neutron flux must be 10% below scram.
   (Peak power ≤ 110% during 74% power test)

3. Steam flow in individual lines must be below the trip setpoint.
   (Peak steam flow ≤ 123.3 psid)

Results

At approximately 74.1% power, each Main Steam Isolation Valve (MSIV) was stroked. The results are shown in Tables 25.1 and 25.2. All acceptance criteria were satisfied. Scram margins were adequate so the test will continue to be performed at not greater than 75% power during the operating cycle.

STARTUP TEST 25 - MAIN STEAM ISOLATION VALVES (Continued)

TABLE 25.1
MSIV Closures at 74.1% Rerate Power

MSIV INDIVIDUAL CLOSURE DATA			
MSIV Closed	Close Time (Seconds)	Peak Pressure (psig)	Peak Flux (Power) (%)
AO-3-02-080A	4.02	1026	85.0
AO-3-02-086A	4.26	1027	84.7
AO-3-02-080B	4.19	1024	84.2
AO-3-02-086B	4.00	1023	85.4
AO-3-02-080C	3.89	1025	84.4
AO-3-02-086C	4.00	1025	86.7
AO-3-02-080D	4.24	1026	85.7
AO-3-02-086D	4.30	1025	85.5

TABLE 25.2
MSIV Closures at 74.1% Rerate Power

	MSL Peak Flow (psid)			
MSIV CLOSED	MSL A	MSL B	MSL C	MSL D
AO-2-02-080A	0	55	60.2	62.4
AO-2-02-086A	0	55.8	51.2	62.3
AO-2-02-080B	57.9	0	58.5	61.3
AO-2-02-086B	57.9	0	58.7	60.8
AO-2-02-080C	59.2	54.2	0	62.0
AO-2-02-086C	59.6	54.3	0	62.2
AO-2-02-080D	59.4	55.5	60.8	0
AO-2-02-086D	59.7	55.4	60.9	0

STARTUP TEST 33 - TURBINE STOP VALVE SURVEILLANCE TEST

Purpose

This test determines the highest power level at which surveillance testing can be performed on the turbine stop valves without causing a reactor scram.

Description

Individual main turbine valves are tested routinely during plant operation as required for turbine surveillance testing. Turbine Stop Valves are tested for power rerate in accordance with RT-O-001-400-3 and Special Procedure SP-2076. Based on the initial results from Test Condition 4 (original 100% power), this test may be performed during Test Conditions 5 and 6.

Level 1 Criteria

None.

Level 2 Criteria

1. Peak neutron flux must be at least 7.5% below the scram trip setting.

2. Peak vessel pressure must remain at least 10 psi below the high pressure scram setting. (Peak Pressure < 1075 psig)

3. Peak steam flow in the main steam lines must remain 10% below the high flow isolation trip setting. (Peak steam flow < 110.97 psid)

Results

In order to have data from which to extrapolate, Turbine Stop Valve testing was initially performed at 90% power. All acceptance criteria were satisfied; therefore, testing could continue at 95% power. The testing at 95% power also satisfied all acceptance criteria. The data from these performances was plotted and extrapolations were performed to determine if testing could be conducted at the subsequent Test Condition (97% power). The extrapolations showed that testing could be performed at 97% power. Testing and susbequent extrapolations at 97% power showed testing could be performed at the 100% rerated power. Testing was again performed at 100% rerated power. All acceptance criteria were met; therefore, future Turbine Stop Valve surveillance testing may be performed at 100% power. No load drops are required based on these test results. A summary of the results from all test performances is shown in Tables 33.1, 33.2, and 33.3.

STARTUP TEST 33 - TURBINE STOP VALVE SURVEILLANCE TEST (Continued)

TABLE 33.1
Flux Peaks During Turbine Main Stop Valve (MSV) Closures

	Actual Test Power Levels (%)			
	90.9	95.7	96.8	99.4
MSV Test	Reactor Peak Power (%)			
MSV1	93	99.0	102	103.5
MSV2	93	99.0	102	103
MSV3	94	99.5	102	103
MSV4	93	99.0	102	104

TABLE 33.2
Reactor High Pressure Peaks During MSV Closures

	Actual Test Power Levels (%)			
	90.9	95.7	96.8	99.4
MSV Test	Reactor Pressure Peak (psig)			
MSV1	1024	1034	1036	1034
MSV2	1024	1033	1036	1034
MSV3	1024	1034	1036	1034
MSV4	1024	1033	1036	1034

STARTUP TEST 33 - TURBINE STOP VALVE SURVEILLANCE TEST (Continued)

Results (Continued)

TABLE 33.3
MSL Flow Peaks During MSV Closures

		MSL FLOW Peak (psid)			
MSV TEST	Test Power	MSL A	MSL B	MSL C	MSL D
MSV1	90.9	Downscale	57.6	58.8	62.7
MSV2		61.4	Downscale	60.2	60.2
MSV3		58.9	55.0	Downscale	60.2
MSV4		58.9	53.8	58.9	Downscale
MSV1	95.7	Downscale	62.7	66.6	70.4
MSV2		69.1	Downscale	67.8	65.3
MSV3		66.6	62.7	Downscale	66.6
MSV4		66.6	61.4	65.3	Downscale
MSV1	96.8	Downscale	65.3	67.8	71.7
MSV2		70.4	Downscale	69.1	67.8
MSV3		67.8	62.7	Downscale	69.1
MSV4		67.8	62.7	67.8	Downscale
MSV1	99.4	Downscale	72.0	74.0	79.2
MSV2		75.2	Downscale	73.6	72.0
MSV3		72	67.2	Downscale	75.2
MSV4		73.6	65.6	72.8	Downscale

STARTUP TEST 34 - TURBINE CONTROL VALVE SURVEILLANCE TEST

Purpose

This test determines the highest power level at which surveillance testing can be performed on the turbine control valves without causing a reactor scram.

Description

Individual main turbine valves are tested routinely during plant operation as required for turbine surveillance testing. Turbine Control Valves are individually stroked at various power levels for power rerate in accordance with Special Procedure SP-2077 to determine the highest power at which the normal surveillance testing can be performed. Based on the test results from Test Condition 4 (original 100% power), this test may be performed during Test Conditions 5 and 6.

Level 1 Criteria

None.

Level 2 Criteria

1. Peak neutron flux must be at least 7.5% below the scram trip setting.
2. Peak vessel pressure must remain at least 10 psi below the high pressure scram setting. (Peak Pressure < 1075 psig)
3. Peak steam flow in each line must remain 10% below the high flow isolation trip setting. (Peak steam flow < 110.97 psid)

Results

In order to have data from which to extrapolate, Turbine Control Valve testing was initially performed at 90% power. All acceptance criteria were satisfied; therefore, testing could continue at 95% power. The testing at 95% power also satisfied all acceptance criteria. The data from these performances was plotted and extrapolations were performed to determine if testing could be conducted at the subsequent Test Condition (97% power). The extrapolations showed that testing could be performed at 97% power. Extrapolations at 97% showed that testing could than be performed at 100% power. Minor adjustments to EHC pressure had no effect on predicting that 100% power testing could be performed.

Testing at 100% power was performed and all acceptance criteria was met. Therefore, testing at 100% power may be performed during cycle operations. No load drops are required based on these test results. A summary of the results from all test performances is shown in Tables 34.1, 34.2, and 34.3.

STARTUP TEST 34 - TURBINE CONTROL VALVE SURVEILLANCE TEST (Continued)

TABLE 34.1
Flux Peaks During Turbine Control Valve (TCV) Closures

	Actual Test Power Levels (%)			
	89.7	95.9	96.8	99.14
TCV Test	Reactor Peak Power (%)			
TCV1	90.0	97.0	98.5	101
TCV2	90.0	97.0	99.0	101
TCV3	91.0	97.0	99.0	101
TCV4	91.5	97.0	99.0	101

TABLE 34.2
Reactor High Pressure Peaks During TCV Closures

	Actual Test Power Levels (%)			
	89.7	95.9	96.8	99.14
TCV Test	Reactor Pressure Peak (psig)			
TCV1	1008	1025	1028	1027
TCV2	1008	1025	1028	1027
TCV3	1008	1025	1028	1027
TCV4	1008	1025	1028	1027

STARTUP TEST 34 - TURBINE CONTROL VALVE SURVEILLANCE TEST (Continued)

Results (Continued)

TABLE 34.3
MSL Flow Peaks During TCV Closures

		MSL FLOW Peak (psid)			
TCV TEST	Test Power	MSL A	MSL B	MSL C	MSL D
TCV1	89.7	49.9	46.1	51.2	51.2
TCV2		51.2	46.1	49.9	51.2
TCV3		49.9	46.1	51.2	51.2
TCV4		51.2	46.1	49.9	51.2
TCV1	95.9	56.3	52.5	56.3	57.6
TCV2		56.3	51.2	57.6	57.6
TCV3		57.6	51.2	56.3	57.6
TCV4		56.3	51.2	56.3	57.6
TCV1	96.8	58.9	53.8	57.6	58.9
TCV2		58.9	53.8	57.6	58.9
TCV3		58.9	53.8	58.9	58.9
TCV4		58.9	53.8	58.9	60.2
TCV1	99.14	60.8	56.0	62.6	62.4
TCV2		62.4	56.0	60.8	62.4
TCV3		62.4	56.0	62.4	62.4
TCV4		62.4	56.0	62.4	64.0

STARTUP TEST 35 - RECIRCULATION AND JET PUMP INSTRUMENTATION CALIBRATION

Purpose

The purpose of this test is to perform a complete calibration of the installed recirculation system flow instrumentation including specific signals to the plant process computer.

Description

At operating conditions which allow the recirculation system to operate at the speeds required for rated flow at 100% rerate power, the jet pump flow instrumentation is adjusted to provide correct flow indication based on the jet pump flow. The total core flow signal to the process computer will be calibrated to accurately read the total core flow. This calibration of the recirculation system is performed in accordance with RT-I-002-250-3, Core Flow Verification.

Level 1 Criteria

None.

Level 2 Criteria

1. Total core flow indicated on the Plant Monitoring System (PMS Point B015), Control Room indicator (DPFR-095), and calculated core flow must agree within ±2%.

2. The percent flow signal to APRM and % core flow calculation numbers must agree within 1%.

Results

Core Flow Verification was performed at approximately 100% rerate power and 100% core flow. Data was collected and core flow calculations were performed. All total core flow indications (PMS Point B315, Control Room indicator DPFR-095, and calculated core flow values) agreed within ±2%. APRM % flow numbers were also calculated and agreed with % core flow calculation numbers within 1%. All acceptance criteria were satisfied.

STARTUP TEST 72 - DRYWELL ATMOSPHERIC COOLING

Purpose

The purpose of this test is to verify the ability of the Drywell Atmosphere Cooling System to maintain design conditions in the drywell during operating conditions.

Description

Drywell temperature is monitored to ensure design limits are not exceeded. There are no changes for rerate which will affect the air flow distribution inside the drywell. The calculated increase in drywell temperature resulting from rerate is 2°F. Drywell temperatures are monitored in accordance with RT-O-40C-530-3, Drywell Temperature Monitoring, at approximately 95% power (original 100% power) and at rerated 100% power.

Level 1 Criteria

Drywell temperature shall not exceed 145°F.

Level 2 Criteria

Drywell temperature shall not exceed 140°F.

Results

At approximately 95% and 100% power, drywell temperature data was collected. Calculations were performed to determine the drywell bulk average temperature at each of these conditions. Drywell bulk average temperature was 125°F at 95% power and 127.6°F at 100% power. All Level 1 and Level 2 acceptance criteria were satisfied.

STARTUP TEST 80 - THERMAL PERFORMANCE DATA COLLECTION

Purpose

The purpose of this procedure is to collect steady state data at 95% rerated power (previous 100% power) at 100% rerated power and for an extended period of seven to nine days at full power following rerate implementation. This data is used to monitor operating thermal performance parameters at rerated power and to establish a baseline at the rerated power. There is no formal acceptance criteria for this test. The information collected is evaluated against historical performance data.

Description

Steady state data on thermal performance parameters is collected and evaluated at steady state conditions at 95% and 100%, and for an extended period at 100% rerate power. The test was performed in accordance with SP-2078, Thermal Performance Data Collection.

Level 1 Criteria

None.

Level 2 Criteria

None.

Results

Data was collected at approximate power levels of 95%, and 100% and for a period of nine days after attaining 100% power using SP-2078. Comparisons were made with historical and predicted values. This data is the baseline for operation at rerated power. No acceptance criteria is associated with this test.

STARTUP TEST 81 - SURVEILLANCE TESTING

Purpose

The test verifies surveillance testing has been performed on all Tech Spec related instrumentation requiring recalibration as a result of power rerate changes.

Description

Surveillance testing is performed on all Technical Specification (Tech Spec) related instrumentation requiring recalibration due to power rerate changes (i.e. setpoint change, range change, etc.). This test contains signoffs for all of the required surveillance tests. A completed copy of this test documents that all the required surveillance testing is complete.

Level 1 Criteria

None.

Level 2 Criteria

None.

Results

All surveillance tests were completed prior to startup with the exception of SI3A-2-RPS-A through DFQ, Functional Test of RPS Card File. This exception was documented by Test Exception Report 95-01. The card file functional was completed prior to the outage instead of during the outage. The card file functional was not effected by rerate even though administratively it was listed in the instrumentation list. All RPS instrumentation providing input to the card file was recalibrated. The card file functional frequency was changed from monthly to quarterly and therefore was not required to be performed during the outage. There was no effect on rerate requirements and no effect on the operation of the plant. This test exception is administrative only.

Rod Block Monitor 'A' and 'B' calibrations/functional checks were completed after startup prior to reaching 30% reactor power. All surveillance testing required for Tech Spec related instrumentation affected by power rerate changes was completed satisfactorily.

STARTUP TEST 82 - STEADY STATE DATA COLLECTION

Purpose

The purpose of this procedure is to collect steady state data during the plant startup following rerate implementation. A portion of this data is used to project, using extrapolation techniques, operating performance parameters at rerated power levels before the previous power rating is exceeded. The balance of data collected is supplemental and may be used in evaluating the extrapolated parameters. The final set of data collected establishes the baseline for the rerated power.

Description

The first two data sets, taken at Test Conditions 2 and 3, include baseline information (for extrapolation) to project operating performance parameters at rerated conditions. Extrapolations of specific important plant parameters will be made from each additional data set collected to project the rerated values at the subsequent test conditions. There is no formal acceptance criteria for this test. The information collected at each test condition will be evaluated against predicted performance values. Predicted values were determined using the data gained from the Unit 2 startup test program.

Data will be collected at approximately the following rerated power levels:

TEST CONDITION	ORIGINAL POWER LEVEL (%)	RERATE POWER LEVEL	RERATE MWT
2	89.3% - 90.3%	85%-86%	2939 - 2974
3	94.5% - 95.6%	90%-91%	3112 - 3147
4	99.8% - 100.8%	95%-96%	3285 - 3320
5	N/A	97%-98%	3354 - 3389
6	N/A	99%-100%	3423 - 3458

Level 1 Criteria

None.

Level 2 Criteria

None.

STARTUP TEST 82 - STEADY STATE DATA COLLECTION (Continued)

Results

Data was recorded for over 160 plant parameters at Test Conditions 2 through 6. For the most part, the data recorded tracked very well with the predicted and/or historical values. Based on the experience gained from Unit 2, procedures were revised prior to startup to set initial EHC pressure set to 940psig and allow a plus or minus 5 psig band of control during operation. With this new setting, reactor pressure was easily controlled at or just below the predicted 100% power value of 1035 psig.

Extrapolations were performed for various instruments recording first stage pressure, turbine inlet pressure, steam flow, feedwater inlet temperatures, and control valve positions. Pressures tracked consistently with the predicted values gained from Unit 2. Initially lowering pressure set to 940psig prevented the higher pressures found during the Unit 2 startup program.

Steam flow tracked very well with the predicted curve from Unit 2; however, the steam flow values typically tracked lower than anticipated. Feedwater temperatures followed the predicted curves; however, the actual temperatures were 8°F to 10° lower than the curve. A review of historical data indicated feedwater temperatures to be lower than the predicted values by about the same amount. The feedwater temperatures at each test condition almost match the historical and extrapolated values; therefore, there is no concern with this data. No action is required.

With EHC Pressure Set at 940 psig plus or minus 5 psig, the control valves opened to within about 1% of the predicted values. This good response was due to a proper initial pressure set and a recalibration of the LVDT.

This concludes the PBAPS Unit 2 Rerate Startup Test Report.

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