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Exelon Nuclear

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United States Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and 50-457

Subject: Supplemental Startup Report for Braidwood Station, Unit 1 - Full Power Uprate Power Ascension

Reference: Letter from James D. von Suskil (Exelon Generation Company, LLC) to U.S. NRC, "Startup Report for Braidwood Station, Units 1 and 2 – Mid-Cycle Power Uprate" dated August 15, 2001

In the referenced letter we submitted a mid-cycle startup report in accordance with the requirements of the Braidwood Station, Technical Requirements Manual, Section 5.0, "Administrative Controls," Section 5.3.a, "Startup Report." Section 5.3.a requires the submittal of a startup report within 90 days following resumption of commercial power operations after an amendment to the license involving a planned increase in power level.

The Unit 1 mid-cycle power ascension started May 13, 2001. Power was raised until the administrative limit of 97.6% Turbine Impulse Pressure was reached. This interim mid-cycle uprated power level was approximately 3468 megawatts thermal (MWt). The remainder of the Full Power Uprate ascension to 3586.6 MWt was recently performed following modifications to the High Pressure (HP) Turbine in the Fall 2001 refueling outage.

The Supplemental Startup Report for Braidwood Station Unit 1 Full Power Uprate Power Ascension (i.e., Attachment 1) summarizes the startup test program and results. The Full Power Uprate Power Ascension Test Program was successfully completed with all acceptance criteria being satisfied. No additional uprate testing or Startup Reports are required for Unit 1.

A Supplemental Startup Report for Unit 2 will be submitted within 90 days following modifications to the HP Turbine in the Spring 2002 refueling outage and the startup test program.

Also enclosed for information are the Braidwood Unit 1 Cycle 10 Startup and Power Ascension Test Results (i.e., Attachment 2).

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If you have any questions or require additional information concerning this report, please contact Ms. Amy Ferko, Regulatory Assurance Manager, at (815) 417-2699.

Respectfully,

James D. von Suskil
Site Vice President
Braidwood Station

Attachments: 1. Braidwood Station Unit 1 Full Power Uprate Ascension Supplemental Startup Report
2. Braidwood Unit 1 Cycle 10 Startup and Power Ascension Test Results

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Braidwood Station

ATTACHMENT 1

BRAIDWOOD STATION UNIT 1

FULL POWER UPRATE ASCENSION

SUPPLEMENTAL STARTUP REPORT

Braidwood Station Unit 1
Full Power Uprate Ascension Supplemental Startup Report

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Executive Summary

In a letter from James D. von Suskil (Exelon Generation Company, LLC) to the U.S. NRC, "Startup Report for Braidwood Station, Units 1 and 2 – Mid-Cycle Power Uprate," dated August 15, 2001, we submitted a mid-cycle startup report in accordance with the requirements of the Braidwood Station, Technical Requirements Manual, Section 5.0, "Administrative Controls," Section 5.3.a. Section 5.3.a requires the submittal of a startup report within 90 days following resumption of commercial power operations after an amendment to the license involving a planned increase in power level.

On May 4, 2001, the NRC issued License Amendment 113 for Braidwood Station, Units 1 and 2, which allowed an increase in the maximum reactor power level from 3411 megawatts thermal (MWt) to 3586.6 MWt. Power ascension on both Braidwood Station units was initiated during mid-cycle operations to an interim level, prior to performing modifications necessary to attain full power uprate.

Unit 1 Full Power Uprate Power Ascension started October 16, 2001 at 1149 hours, and was completed at 1413 hours when the administrative limit of 99.9% calorimetric power was reached. The Full Power Uprate Power Ascension load ramp was successfully completed with all acceptance criteria being satisfied.

A Supplemental Startup Report for Unit 2 will be submitted within 90 days following modifications to the High Pressure Turbine in the Spring 2002 refueling outage and the startup test program.

Braidwood Station, Unit 1 Full Power Uprate Power Ascension
Supplemental Startup Report

1.0 Purpose

This Supplemental Startup Report is submitted to the NRC to satisfy the reporting requirements of the Braidwood Station's Technical Requirements Manual, Section 5.3.a, "Startup Report," which requires this report to address the following items:

1. Address each of the tests identified in the Updated Final Safety Analysis Report.

2. Include a description of the measured values of the operating conditions or characteristics obtained during the test program and a comparison of these values with design predictions and specifications.

3. Describe corrective actions required to obtain satisfactory operation.

4. Include any additional specific details required in license conditions based on other commitments.

2.0 Full Power Uprate Power Ascension Program Scope

2.1 Program Development

The development of the power uprate test recommendations and acceptance criteria was based on the review of similar power uprate test programs performed at other nuclear plants, and the generic guidelines provided in WCAP-10263, "A Review Plan for Uprating the License Power of a PWR Power Plant," dated 1983.

The full power uprate Power Ascension Test Program verified the following items:

- Automatic control systems and equipment affected by the Full Power Uprate Power Ascension are maintained within selected operating limits.

- Chemistry parameters are below the "Action" levels.

- Steam Generator feedwater flow and water level are satisfactorily maintained in automatic control.

- The feedwater heater level control system is stable.

- Selected Area Radiation Surveys have been updated and found acceptable.

- Condensate / Condensate Booster and Heater Drain pump swaps do not cause any divergent oscillations.

2.2 Prerequisites for Full Power Uprate Power Ascension Testing

Prior to the commencement of full power uprate power ascension testing, a special test procedure required the completion of numerous activities. These activities included the following items.

- The applicable plant instrumentation setpoint changes or recalibrations were completed as determined by the Power Uprate Master Design Change Package (DCP).
- Plant modifications required to support operation at the full uprate power level were closed out.
- The Clearance Order Log and the Operation Configuration Change log were reviewed to assure there was no effect on uprate testing.
- Baseline data was taken at 3470 MWt.

2.3 Full Power Uprate Power Ascension Testing

Full power uprate power ascension was performed in accordance with a Braidwood Station Special Procedure (SPP). A Heightened Level of Awareness (HLA) briefing was completed with operations and other appropriate plant personnel prior to power ascension.

Full power uprate power ascension occurred using four sequential ramps until the administrative limit of 99.9% calorimetric power was obtained. Following the power increase, testing and equipment performance data were collected and evaluated in accordance with established test acceptance criteria. At the 99.9% full power plateau, the following activities were performed:

- Reactor fuels parameters were evaluated.
- Automatic control systems were evaluated.
- Chemistry evaluations were conducted.
- Feedwater and main steam parameters for turbine driven main feedwater pump speed, feedwater control valve position, feedwater pump, condensate pump and condensate booster pump suction pressure net positive suction head (NPSH) requirements, and steam generator water level control were evaluated.
- Feedwater heater level control performance data were evaluated.
- Main generator stator internal temperature data were collected and evaluated.
- Radiation surveys were performed and evaluated at key points in the power ascension sequence.

- Secondary plant and turbine/generator system performance were evaluated.
- Condensate / Condensate Booster system performance was evaluated.
- A selected set of equipment performance data (e.g., plant process computer points, control room readings, and local readings) was collected and evaluated.

2.4 Test Acceptance Criteria

General Discussion

The development of the power uprate test recommendations and acceptance criteria was based on the review of similar power uprate test programs performed at other plants and the power uprate master DCP.

Following the load increase in power level to 99.9% calorimetric power, test data recorded during the power ascension were evaluated and compared to performance acceptance criteria (i.e., design predictions or limits). If the test data satisfied the acceptance criteria, then system and component performance were determined to comply with their design requirements.

Plant parameters during full power uprate power ascension were evaluated using two levels of acceptance criteria. The criteria associated with plant safety were classified as Level 1. The criteria associated with design expectations were classified as Level 2. The following paragraphs describe the actions required to be taken if an individual criterion was not satisfied.

Level 1 Acceptance Criteria

Level 1 acceptance criteria normally relate to the values of process variables for components and systems determined during the design of the plant. If a level 1 test criterion is not satisfied, the plant must be placed in a safe "hold" condition. Plant operating or test procedures or the Technical Specifications may guide the decision on the appropriate actions to be taken. Resolution of the problem must be immediately pursued by equipment adjustments or through engineering evaluation, as appropriate. Following resolution, the applicable test steps must be repeated to verify that the Level 1 acceptance criterion is satisfied. A description of the problem must be included in the test report documenting successful completion of the test.

For the Braidwood Station full power uprate power ascension, the following specific Level 1 acceptance criteria were established:

- The Reactor Coolant System (RCS) average temperature is automatically maintained within ± 1.5 °F of its reference temperature during steady state operations when control rods are in the automatic mode of control.

- The chemical and volume control system can maintain RCS volume and a steady RCS boron concentration during steady state power level and routine power changes without excessive operator intervention.

- Steam generator feedwater flow and steam generator water level are satisfactorily maintained in automatic control.

- The turbine driven main feedwater pump speed during steady state conditions does not exceed 5500 RPM.

All the above Level 1 criteria were met for Unit 1 following the full power uprate power ascension.

Level 2 Acceptance Criteria

If a Level 2 acceptance criteria limit is not satisfied, then startup testing may proceed after an investigation by testing, engineering, and operations personnel. The limits stated in this category are usually associated with expectations of system performance whose characteristics can be improved by equipment adjustments.

For the Braidwood full power uprate power ascension, the following specific Level 2 acceptance criteria were established.

System and Equipment Performance

- System and Equipment Level 2 acceptance limits are identified in various attachments of the appropriate SPP. Any limits that were exceeded required a documented evaluation in the SPP Test Report.

Turbine Generator Temperature Monitoring System (TGTMS)

- TGTMS Data are within Acceptance Limits.

- Turbine Supervisory Vibration Data are within Acceptance Limits.

Plant Instrumentation

- RCS delta temperature power and calorimetric power are within plus or minus 2% of the plant process computer (PPC) indication.

- Nuclear Instrumentation and calorimetric power are within plus or minus 2%.

- RCS flow between pre-uprate PPC points and post- uprate PPC points are within plus or minus 2%.

- Steam Flow / Feed Flow Mismatch are less than 2% between pre-uprate PPC points and post-uprate PPC points.

- RCS pressure remains stable with no unexpected operation of backup heaters during steady state power operation.

3.0 Unit 1 - Summary of Testing and Equipment Performance Results

3.1 Unit 1 Power Ascension Chronological Sequence of Events

No.	Event Description	Time – Date
1	Obtained Baseline Data at the 3468 MWt Plateau	1500 – 10/15/01
2	Completed Heighten Level of Awareness (HLA) Brief	1030 – 10/16/01
3	Commenced ramp to 99.9% calorimetric power	1149 – 10/16/01
4	Completed ramp to 99.9% calorimetric power	1413 – 10/16/01
5	Completed review and signoff of testing for the full power uprate power ascension plateau	1400 – 10/31/01

3.2 Unit 1 - Control Systems Performance Results

Control Systems most affected by the full power uprate power ascension were monitored to assure acceptable performance and compliance with their specific Level 1 and 2 acceptance criteria. The following table summarizes these control systems.

No.	Control System Description	Level 1 Acceptance Criteria	Level 2 Acceptance Criteria	Tuning Adjustments Required
1	RCS (Pressurizer) Pressure	Satisfied	Satisfied	None
2	Pressurizer Level Control	Satisfied	Satisfied	None
3	Rod Control	Satisfied	Satisfied	None
4	Steam Generator Level Control System	Satisfied	Satisfied	None
5	Feedwater Pump Speed Control	Satisfied	Satisfied	None
6	Steam Flow / Feed Flow Mismatch	Satisfied	Satisfied	None
7	Feedwater Heater Level Control System	Satisfied	Satisfied	None
8	DEHC Control System	Satisfied	Satisfied	None

3.3 Unit 1 – System and Equipment Performance Results

The following systems and selected equipment within the plant most affected by full power uprate power ascension were closely monitored to assure that equipment performed as predicted and that they operated within their design requirements.

No.	System Description	Level 1 Operating Limits	Level 2 Operating Limits	Equipment Performance
1	Condensate System	Satisfied	Satisfied	Acceptable
2	Condenser	Satisfied	Satisfied	Acceptable
3	Condensate Booster System	Satisfied	Satisfied	Acceptable
4	Feedwater System	Satisfied	Satisfied	Acceptable
5	Heater Drain System	Satisfied	Satisfied	Acceptable
6	Reactor	Satisfied	Satisfied	Acceptable
7	Reactor Coolant System	Satisfied	Satisfied	Acceptable
8	Main Steam System	Satisfied	Satisfied	Acceptable
9	Main Turbine	Satisfied	Satisfied (1)	Acceptable
10	Main Transformer	Satisfied	Satisfied	Acceptable
11	Auxiliary Transformers	Satisfied	Satisfied	Acceptable
12	Generator Cooling System	Satisfied	Satisfied	Acceptable
13	Generator Condition Monitoring	Satisfied	Satisfied	Acceptable
14	Main Generator and Exciter Field	Satisfied	Satisfied	Acceptable
15	Isophase Bus Cooling	Satisfied	Satisfied	Acceptable
16	Reheater Systems	Satisfied	Satisfied	Acceptable

(1) The # 4 Governor Valve drifted to the 100% open position subsequent to the ramp to 100% power. The # 4 Governor Valve is currently modulating between 50 to 100% open due to average Tave changes corresponding to boric acid addition to the RCS to offset the burnup of fuel and burnable poisons. The Test Director along with Engineering and Operations personnel reviewed the cycling of Governor Valve # 4 based on changes to Tave and have concluded that this was a normal plant response and has been evaluated as an acceptable operating limit based on past practice.

3.4 Unit 1 – Review and Approval of Testing at the Full Power Uprate Plateau

1. Reactor Fuel Parameters: Fuel thermal margins were found acceptable for continued operation at the full power uprate power ascension plateau as demonstrated by power ascension testing performed in accordance with surveillance procedure BwVS TRM 3.1.h.1 following reload.

2. Automatic Control Systems: All automatic control systems were acceptable for continued operation at the full power uprate power ascension plateau.

3. Chemistry Approval: RCS, Condensate and Feedwater chemistry did not reach Chemistry Action Levels.

4. Feedwater and Main Steam Parameters: The turbine driven main feedwater pump speed, feedwater control valve position, and steam generator water level met Level 2 acceptance criteria. Feedwater pump, condensate pump and condensate booster pump suction pressures exceeded NPSH requirements. Feedwater Heater Level Control performance data was taken and evaluated to be acceptable. Equipment performance was determined to be acceptable at the full power uprate plateau.

5. Main Generator Parameters: Generator stator temperatures and bus bar temperatures satisfied their Level 2 acceptance limits. Generator conditions were also satisfactory for continued operation at the full power uprate plateau.

6. Radiation Protection Approval: Surveys were performed and all radiological conditions were found acceptable for operation at the full power uprate plateau.

7. Secondary Plant And Turbine/Generator Systems Approval: System and Equipment data obtained by System Engineering were reviewed and performance found acceptable at the full power uprate plateau.

8. Condensate (CD) / Condensate Booster (CB) System Approval: CD Pump and CB Pump pressures, flows, temperatures, and motor amps were found acceptable. Current computer alarm setpoints and scaling changes made as part of the power uprate were found acceptable.

9. Main Control Room Instrumentation: Zone banding was reviewed and the necessary changes were provided to the Procedure Group.

3.5 Unit 1 - Exceptions

Equipment and Test Exceptions

All Level 1 and 2 Acceptance Criteria were satisfied and equipment and system performance behaved in accordance with predicted expectations with the exception of the #4 Governor Valve drifting to the 100% open position subsequent to the ramp to 100% power. This condition was reviewed and accepted by testing, engineering, and operations personnel.

4.0 Application of the UFSAR Initial Startup Test Program to the Braidwood Full Power Ascension Test Program

4.1 General Discussion

The development of the power uprate test recommendations and acceptance criteria is based on the review of similar test programs performed at other nuclear plants; Westinghouse Topical Report, WCAP-10263, "A Review Plan for Uprating the License Power of a PWR Power Plant," dated 1983; and Section 7, "Output Determination," of the Westinghouse "Revised Proposal for Power Uprate," dated August 23, 1999. WCAP-10263 recommends that a test program be developed

on a plant specific basis addressing the significance of hardware modifications and the magnitude of the power uprate. The Braidwood Station hardware upgrades were limited to instrument setpoint scaling changes and minor equipment modifications that were completed as part of the plant modification process.

The Updated Final Safety Analysis Report (UFSAR) Chapter 14, "Initial Test Program," addresses the Braidwood initial test program. The initial test program included both preoperational and initial startup testing. Each of these programs is discussed in the following paragraphs:

4.1.1 Preoperational Tests

Preoperational testing consisted of system performance tests performed prior to core load on completed systems prior to final acceptance. These tests demonstrated the capability of structures, systems and components to meet safety related performance requirements.

This category of tests is now conducted as part of the post modification testing process. The full power uprate modification tests were successfully completed as part of the modification process and work control process.

4.1.2 Initial Startup Tests

Initial startup testing consisted of those single and multi-system tests that occurred during or after fuel loading and which demonstrated overall plant performance. This included such activities as precritical tests, low-power tests (i.e., including criticality tests), and power ascension tests. This testing confirmed the design bases and demonstrated, where possible, that the plant is capable of withstanding the anticipated transients and postulated accidents.

This category of tests was reviewed for applicability in developing the Braidwood Station Full Power Uprate Test Program.

4.1.3 Comparison of UFSAR Startup Tests to Power Ascension Tests

The following table addresses each of the initial power ascension tests and their applicability to the Braidwood Station Full Power Uprate Power Ascension Test Program. Tests identified with a 'Yes' were incorporated into the Braidwood Station Full Power Uprate Power Ascension Test Program.

Test No. (1)	Startup Test Title	Required in Full Power Uprate Test Procedure	Acceptance Criteria Same as UFSAR
14.2-62	Initial Core Load	No	NA
14.2-63	Control Rod Drives	No	NA
14.2-64	Rod Position Indicators	No	NA
14.2-65	Reactor Trip Circuit	No	NA
14.2-66	Rod Drop Measurements	No	NA
14.2-67	Incore Flux Monitor System	No	NA
14.2-68	Nuclear Instrumentation	No	NA
14.2-69	Reactor Coolant System Pressure	No	NA
14.2-70	Reactor Coolant System Flow	No	NA
14.2-71	Pressurizer Effectiveness	No	NA
14.2-72	Water Chemistry	Yes (2)	Yes
14.2-73	Radiation Surveys	Yes (3)	Yes
14.2-74	Effluent Radiation Monitors	No	NA
14.2-75	Initial Criticality	No	NA
14.2-76	Power Ascension	Yes (4)	Yes
14.2-77	Moderator Temperature Reactivity Coefficient Measurement	No	NA
14.2-78	Control Rod Reactivity Worth Measurement	No	NA
14.2-79	Boron Reactivity Worth Measurement	No	NA
14.2-80	Flux Distribution Measurement	No	NA
14.2-81	Pseudo Rod Ejection	No	NA
14.2-82	Power Reactivity Coefficient Measurement	No	NA
14.2-83	Core Performance Evaluation	No	NA
14.2-84	Flux Asymmetry Evaluation	No	NA
14.2-85	Full-Power Plant Trip	No	NA
14.2-86	Shutdown from Outside the Control Room	No	NA
14.2-87	Loss of Offsite Power	No	NA
14.2-88	10% Load Swing	No	NA
14.2-89	50% Load Reduction	No	NA
14.2-90	RTD Cross-Calibration	No	NA
14.2-91	Turbine Trip from 25% Power	No	NA

Notes: (1) UFSAR Chapter 14 table numbers.
(2) Water Chemistry at uprate power in accordance with Chemistry Action Levels.
(3) Radiation Surveys done in certain specified areas.
(4) Special Test Procedure at full uprate power was implemented.

5.0 GENERAL DISCUSSION

5.1 Unit 1

Power was raised on Unit 1 until 99.9 % calorimetric power was reached. The full power level of 3586.6 Megawatts Thermal (MWt) was obtained. This

concludes the Braidwood Unit 1 startup and power escalation testing following completion of the startup program for an amendment to the license involving a planned increase in power level.

5.1 Unit 2

The remainder of the Unit 2 Full Power Uprate power ascension testing will be performed following the modifications to the HP Turbine in the Spring 2002 refueling outage (i.e., A2R09). Braidwood Unit 2 will complete the power ascension to the full uprated power level of 3586.6 MWt upon normal return to service following the refueling outage. A Unit 2 Supplemental Report will be issued within 90 days following completion of the startup program.

ATTACHMENT 2

BRAIDWOOD STATION

UNIT 1 CYCLE 10

STARTUP AND POWER ASCENSION TEST RESULTS

Braidwood Station
Unit 1 Cycle 10
Startup and Power Ascension Test Results

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Braidwood Station Unit 1 Cycle 10 Startup and Power Ascension Test Results

1.0 Introduction

Braidwood Station conducted a comprehensive test program following reload. The test program outlined in this report summarizes events and testing performed during the first heatup and power ascension to 100% following full uprate.

The Braidwood Unit 1 Cycle 10 (U1C10) core includes a feed batch of 89 fuel assemblies manufactured by Westinghouse. The new fuel region incorporates Integral Fuel Burnable Absorber (IFBA) rods with a B-10 loading of 1.6X and a 100 psig backfill pressure. Sixteen twice burned Unit 2 assemblies were reinserted with refurbished top nozzles. Table 1.1 contains characteristics of the Braidwood Unit 1 Cycle 10 core design.

The Cycle 10 reactor core achieved initial criticality on October 11, 2001, at 1620 hours. The Unit 1 Main Generator was synchronized to the grid on October 12, 2001 at 1405 hours. Power escalation testing, including testing at full power, was completed on October 17, 2001.

Table 1.1
Braidwood Unit 1 Cycle 10 Core Design Data

- Unit 1 Cycle 9 Burnup: 526 EFPD
- Unit 1 Cycle 10 design length: 531 EFPD

Region	Fuel Type	Number of Assemblies	Enrichment w/o U-235	Cycles Burned
9A*	VANTAGE +	16	4.600	2
11A	VANTAGE +	36	4.796	1
11B	VANTAGE +	52	4.600	1
12A	VANTAGE +	52	4.940	0
12B	VANTAGE +	37	4.747	0

*Unit 2 Region 9A

2.0 Core Testing

2.1 Low Power Physics Testing

Low Power Physics Testing (LPPT) is performed at the beginning of each cycle and a summary of the Startup Physics Test results from U1C10 is contained in Table 2.1. All test results were determined to be acceptable.

2.2 Power Escalation Testing

Power Escalation Testing is performed during the initial power ascension to full power for each cycle and is controlled by surveillance procedure BwVS TRM 3.1.h.1. Tests are performed from 0% through 100% with major testing plateaus at approximately 50%, and 100% power. Significant tests included:

- Core Power Distribution measurements.
- Reactor Coolant System Delta-T Measurements.
- Hot Full Power Critical Boron Concentration Measurement.
- Reactor Coolant System Flow Measurements.

2.3 Core Power Distribution

Core power distribution measurements were performed during power escalation at intermediate power (i.e., less than 50%) and full power. Measurements are made to verify flux symmetry and to verify core peaking factors are within limits. Data obtained during these tests are used to check calibration of Power Range Nuclear Instrumentation System (NIS) channels and to calibrate them if required. Measurements are made using the Moveable Incore Detector System and analyzed using the BEACON computer code.

Results of the core power distribution measurements at <50%, and full power are shown in Tables 2.2 and 2.3, respectively.

2.4 Full Power Loop Delta-T Determination

The purpose of this test is to determine the full power Delta-T for each Reactor Coolant loop in order to recalibrate any loop with significant change. This procedure is applicable in MODE 1 and is performed above 95% Rated Thermal Power (RTP) after each refueling outage. Results are contained in Table 2.4.

2.5 Reactor Coolant System Flow Measurement

The purpose of this test is to verify by precision heat balance that RCS total flow rate is $\geq$ 380,900 gpm and within the limits specified in the COLR ($\geq$ 380,900). Results are contained in Table 2.5.

Table 2.1
A1R09 Startup Physics Test Results

Parameter	Predicted	Measured	Difference		Review Criteria	Acceptance Criteria
ARO Critical Boron	1401 ppm	1404 ppm	3 ppm		± 50 ppm	± 1000 pcm
ARO ITC	-3.852 pcm/°F	-4.603 pcm/°F	0.751 pcm/°F		± 2 pcm/°F of design value	N/A
ARO MTC	-2.253 pcm/°F	-2.504 pcm/°F	0.251 pcm/°F		N/A	Within Tech Spec 3.1.1.3
Control Bank A Worth	379.9 pcm	388.8 pcm	2.3%	8.9 pcm	≤15% or ≤100 pcm of design	N/A
Control Bank B Worth	525.5 pcm	483.2 pcm	8.0%	42.3 pcm	≤15% or ≤100 pcm of design	N/A
Control Bank C Worth	863.9 pcm	818.7 pcm	5.2%	45.2 pcm	≤15% or ≤100 pcm of design	N/A
Control Bank D Worth	627.7 pcm	587.5 pcm	6.4%	40.2 pcm	≤15% or ≤100 pcm of design	N/A
Shutdown Bank A Worth	202.9 pcm	188.6 pcm	7.0%	14.3 pcm	≤15% or ≤100 pcm of design	N/A
Shutdown Bank B Worth	836.8 pcm	770.4 pcm	7.9%	66.4 pcm	≤15% or ≤100 pcm of design	N/A
Shutdown Bank C Worth	375.6 pcm	361.9 pcm	3.6%	13.7 pcm	≤15% or ≤100 pcm of design	N/A
Shutdown Bank D Worth	374.5 pcm	360.7 pcm	3.7%	13.8 pcm	≤15% or ≤100 pcm of design	N/A
Shutdown Bank E Worth	472.6 pcm	471.9 pcm	0.1%	0.7 pcm	≤15% or ≤100 pcm of design	N/A
Total Rod Worth	4659.4 pcm	4431.7 pcm	4.9%	227.7 pcm	≤ 5.6% between measured & predicted	≥ 93% of the sum of the predicted worths

Table 2.2
Core Power Distribution Results - <50% Power

Plant Data

Map ID:	BW11001
Date of Map:	10/13/2001
Cycle Burnup:	0.3 EFPD
Power Level:	46.9%
Control Bank D Position:	200 steps

Fluxmap Results

Core Average Axial Offset	2.1%
Quadrant Power Tilt Ratios: Quadrant (N41):	1.005
Quadrant (N42):	1.002
Quadrant (N43):	1.000
Quadrant (N44):	0.993
Max. Nuclear Enthalpy Rise Hot Channel Factor	1.5180
Nuclear Enthalpy Rise Hot Channel Factor Limit	1.9708
Max. Steady State Heat Flux Channel Factor	1.8477
Steady State Heat Flux Channel Factor Limit	4.9721
Max. Transient Heat Flux Channel Factor	2.290
Transient Heat Flux Channel Factor Limit	3.988

Table 2.3
Core Power Distribution Results - Full Power

Plant Data

Map ID:	BW11002
Date of Map:	10/17/2001
Cycle Burnup:	3.996 EFPD
Power Level:	99.9%
Control Rod Position:	222 steps

Fluxmap Results

Core Average Axial Offset	-7.08%
Quadrant Power Tilt Ratios: Quadrant (N41):	1.004
Quadrant (N42):	1.006
Quadrant (N43):	0.996
Quadrant (N44):	0.993
Max. Nuclear Enthalpy Rise Hot Channel Factor	1.5331
Nuclear Enthalpy Rise Hot Channel Factor Limit	1.7005
Max. Steady State Heat Flux Channel Factor	1.9238
Steady State Heat Flux Channel Factor Limit	2.6026
Max. Transient Heat Flux Channel Factor	2.1965
Transient Heat Flux Channel Factor Limit	2.270

Table 2.4
Full Power Loop Delta-T

LOOP	Thot (°F)	Tcold (°F)	Full Power Delta-T (°F)
A	616.8	556.5	60.3
B	615.9	555.7	60.2
C	616.5	556.5	60.0
D	616.0	555.4	60.6

Table 2.5

RCS Flow vs. Acceptance Criteria

RCS LOOP	Measured Flow (gpm)	Minimum Flow Requirement (gpm)
1A	101,167	
1B	100,294	
1C	101,498	
1D	99,600	
Total	402,559	≥ 380,900

Above data taken from Appendix B-M of 1BwVSR 3.4.1.4 RCS Flow Measurement