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Subject: McGuire Nuclear Station
Docket No. 50-370
Unit 2, Cycle 14 Startup Report

Attached is the McGuire Nuclear Station Unit 2 Cycle 14 Startup Report for Criticality, Zero Power Physics Testing, and Power Escalation Testing as required by Selected Licensee Commitment (SLC) 16.14.1, "Startup Reports." This SLC requires a summary report within 90 days following resumption of commercial power operation if fuel of a different design or manufactured by a different fuel supplier has been installed. This report is submitted due to the use of Westinghouse Robust Fuel Assemblies (RFA).

All testing acceptance criteria were satisfied indicating the newly loaded core was behaving as designed.

Questions concerning this report should be directed to Kay Crane, McGuire Regulatory Compliance at (704) 875-4306.

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Duke Power Company
McGuire Nuclear Station
Unit 2 Cycle 14
STARTUP REPORT

October 2000

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1.0 INTRODUCTION

McGuire Unit 2 Cycle 14 is the first Unit at McGuire to use the Westinghouse Robust Fuel Assembly (RFA). The M2C14 core consists of a feed batch of 84 RFA fuel assemblies. The feed batch enrichments are 48 F/A's at 3.77 weight percent, and 36 F/A's at 4.33 weight percent. Burnable absorbers accompanying the feed batch are of two designs: Integral Fuel Burnable Absorber (IFBA) and Wet Annular Burnable Absorber (WABA), both manufactured by Westinghouse. The Westinghouse IFBA design is a very thin coating of Zirconium Diboride on the surface of the fuel pellet to act as a burnable poison, reducing the need for separate discrete burnable poison assemblies whereas WABA's are rods containing a discrete burnable poison. WABA's are functionally equivalent to the Framatome-Cogema Burnable Poison Rod Assemblies (BPRA).

M2C14 core loading commenced at 1333 on September 29, 2000 and concluded at 1452 on October 1, 2000. Initial criticality for cycle 14 occurred at 0651 on October 12, 2000. Zero Power Physics Testing was completed at 1457 on October 12, 2000. The unit reached full power at 2018 on October 16, 2000.

Table 1 contains some important characteristics of the McGuire 2 Cycle 14 core design.

TABLE 1
M2C14 CORE DESIGN DATA

1. M2C13 end of cycle burnup: 478 EFPD

2. M2C14 design length: 480 ± 10 EFPD

Region	Fuel Type	Number of Assemblies	Enrichment, w/o U^{235}	Loading, MTU$^{\Psi}$	Cycles Burned
12B	MkBW	1	3.95	0.4562	2
13A	MkBW	8	3.90	3.6496	3
13B	MkBW	4	4.15	1.8248	3
14A	MkBW	16	3.78/2.0*	7.2992	2
15A	MkBW	48	4.09/2.6**	21.8976	1
15B	MkBW	32	4.39/2.6**	14.5984	1
16A	W RFA	48	3.77/2.6***	21.8496	0
16B	W RFA	36	4.33/2.6***	16.3872	0
Totals		193		87.9626	

Ψ Design MTU loadings are used in all calculations.
* 2.00 w/o enriched U blanketed fuel assemblies (6 inches top and bottom)
** 2.60 w/o solid enriched U blanketed fuel assemblies (6 inches top and bottom)
*** 2.60 w/o enriched annular U blanketed fuel assemblies (6 inches top and bottom)

2.0 PRECRITICAL TESTING

Precritical testing includes:

- Core Loading
- Preliminary Calibration of Nuclear Instrumentation
- Dilution of Reactor Coolant System to Estimated Critical Boron concentration
- Rod Drop Timing Test

Sections 2.1 through 2.4 describe results of precritical testing for McGuire 2 Cycle 14.

2.1 Total Core Reloading

The Cycle 14 core was loaded under the direction of PT/0/A/4150/033, Total Core Reloading. Plots of Inverse Count Rate Ratio (ICRR) versus number of fuel assemblies loaded were maintained for each source range channel.

Core loading commenced at 1333 on September 29, 2000 and concluded at 1452 on October 1, 2000. Core loading was verified by PT/0/A/4550/003C, Core Verification.

2.2 Preliminary NIS Calibration

Periodic test procedure PT/0/A/4600/078, Preliminary NIS Calibration, is performed before initial criticality for each new fuel cycle. Intermediate range reactor trip and rod stop setpoints are adjusted using measured power distribution from the previous fuel cycle and predicted power distribution for the upcoming fuel cycle. Power Range NIS full power currents are similarly adjusted. Intermediate Range NIS Rod Stop and Reactor Trip setpoints are checked and revised as necessary for initial power ascension.

Table 2 shows the calibration data calculated by PT/0/A/4600/078.

2.3 Reactor Coolant System Dilution

The reactor coolant system boron concentration was diluted from the refueling boron concentration to the estimated critical boron concentration per PT/0/A/4150/009, NCS Dilution with Shutdown Banks Inserted. Inverse Count Rate Ratio (ICRR) was plotted versus gallons of demineralized water added.

Initial reactor coolant boron concentration was 1810 ppmB. The estimated critical boron concentration was calculated to be 1687ppmB. The calculated volume of demineralized water required was 5304 gallons. This change in boron concentration was expected to decrease ICRR from 1.0 to 0.84.

Reactor coolant system dilution was performed from 1105 to 1205 on October 10, 2000. The final reactor coolant system boron concentration, after allowing system to mix, was 1675 ppmB. Figure 1 shows ICRR versus volume of water used. The NC System was not diluted below Keff < 0.99 or Shutdown Margin boron limits.

2.4 Control Rod Drop Timing Test

This test is performed prior to each post-refueling startup to verify that, when dropped from the fully withdrawn position at hot, no-load conditions, each RCCA completely inserts and the drop time is ≤ 2.2 seconds (pursuant to Tech. Spec. Surveillance Requirement 3.1.4.3). The 2.2 second criterion applies to the time measured from the beginning of decay of Stationary Gripper coil voltage to Dashpot entry.

All BOC14 RCCA drop times satisfied the acceptance criterion. Table 3 summarizes not only the BOC14 data, but for comparison purposes, the BOC13 drop times as well. It should be noted that "Time to Dash Pot" is the data to be compared to the 2.2 second criterion. "Time to Dash Pot" is a parameter that is measured for the purposes of assessing resistance to the RCCA in the Dash Pot region.

TABLE 2
PRELIMINARY NIS CALIBRATION DATA

Intermediate Range

Channel	Ratio (BOC 14 ÷ Cycle 13)	Cycle 13 Reactor Trip Setpoint, Amps	BOC 14 Reactor Trip Setpoint, Amps	BOC 14 Rod Stop Setpoint, Amps
N35	0.757	4.166×10^{-5}	4.3761×10^{-5}	2.6256×10^{-5}
N36	0.750	5.125×10^{-5}	4.9690×10^{-5}	2.9814×10^{-5}

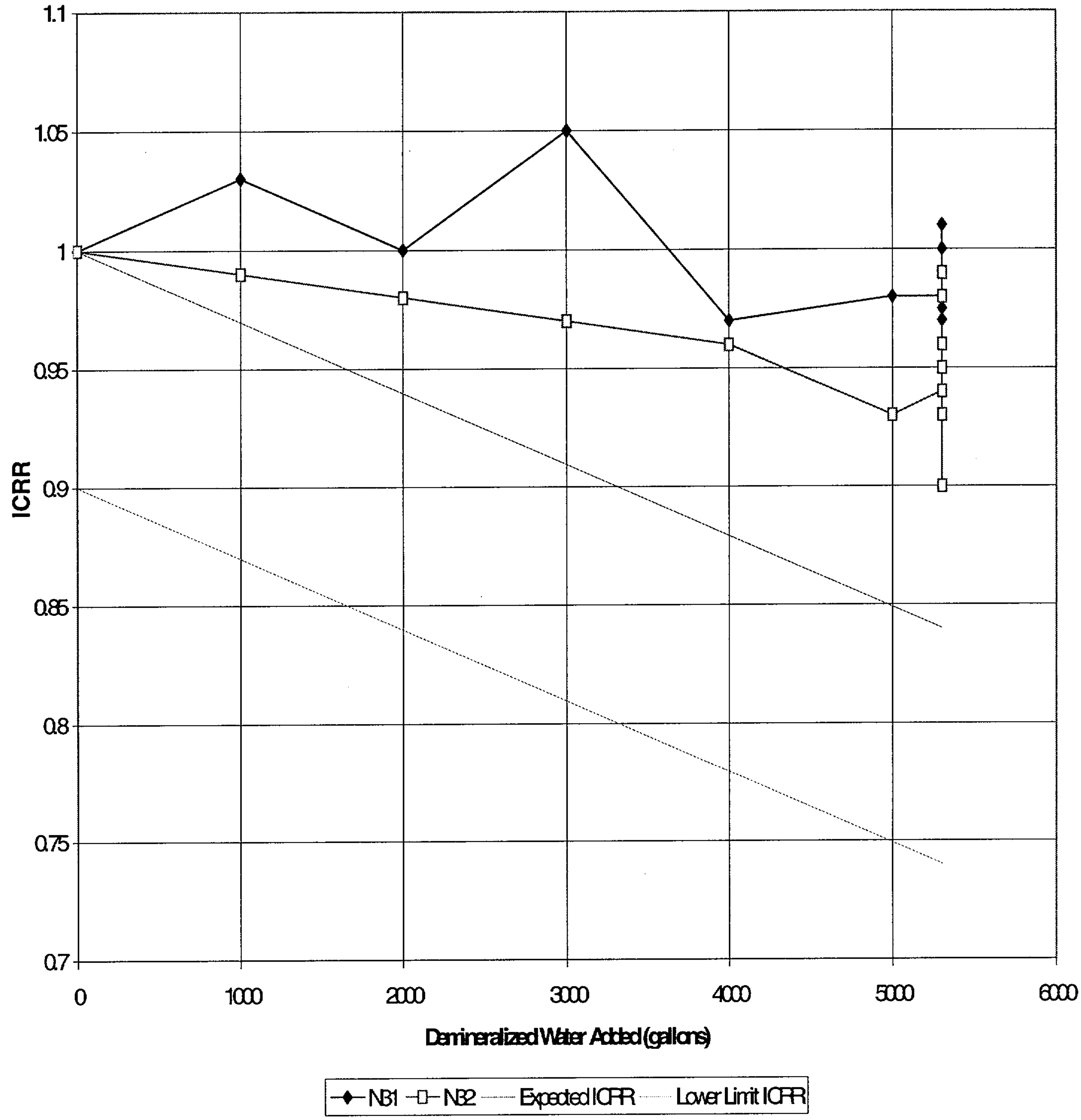
Power Range

Channel	Ratio (BOC 14 ÷ Cycle 13)	Axial Offset, %	Cycle 13 (BOC) Full Power Current, μAmps		BOC 14 Full Power Current, μAmps	
			Upper	Lower	Upper	Lower
N41	0.762	+30	202.0	136.9	160.2	115.4
		0	162.9	179.9	131.1	148.9
		-30	123.8	222.9	101.9	182.3
N42	0.749	+30	291.7	198.5	244.3	175.6
		0	236.6	259.9	200.5	222.5
		-30	181.7	321.3	156.6	269.5
N43	0.759	+30	256.2	180.5	216.9	159.3
		0	209.7	236.4	180.0	203.6
		-30	163.3	292.3	143.1	248.0
N44	0.758	+30	263.4	183.2	228.6	165.8
		0	215.4	237.9	188.5	208.8
		-30	167.3	292.7	148.4	252.0

Table 3
Cycle 13 and Cycle 14 Rod Drop Timing Results

M2C14		M2C13	
Rod Location	Time to Dash Pot (seconds)	Rod Location	Time to Dash Pot (seconds)
D2	1.483	D2	1.543
B12	1.483	B12	1.423
M14	1.484	M14	1.504
P4	1.504	P4	1.424
B4	1.484	B4	1.344
D14	1.505	D14	1.525
P12	1.465	P12	1.365
M2	1.485	M2	1.605
G3	1.446	G3	1.326
C9	1.446	C9	1.406
J13	1.446	J13	1.366
N7	1.447	N7	1.347
C7	1.447	C7	1.387
G13	1.447	G13	1.387
N9	1.448	N9	1.408
J3	1.448	J3	1.408
E3	1.468	E3	1.408
C11	1.429	C11	1.368
L13	1.489	L13	1.589
N5	1.449	N5	1.389
C5	1.45	C5	1.37
E13	1.49	E13	1.43
N11	1.45	N11	1.39
L3	1.47	L3	1.37
H4	1.431	H4	1.351
D8	1.431	D8	1.311
H12	1.411	H12	1.371
M8	1.472	M8	1.392
H6	1.452	H6	1.352
H10	1.472	H10	1.372
F8	1.473	F8	1.373
K8	1.433	K8	1.393
F2	1.453	F2	1.433
B10	1.454	B10	1.394
K14	1.454	K14	1.494
P6	1.454	P6	1.354
B6	1.495	B6	1.375
F14	1.475	F14	1.495
P10	1.455	P10	1.395
K2	1.496	K2	1.436
H2	1.456	H2	1.416
B8	1.456	B8	1.356
H14	1.477	H14	1.417
P8	1.437	P8	1.357
F6	1.457	F6	1.377
F10	1.458	F10	1.418
K10	1.478	K10	1.378
K6	1.458	K6	1.398
D4	1.439	D4	1.375
M12	1.459	M12	1.339
D12	1.479	D12	1.394
M4	1.46	M4	1.4
H8	1.62	H8	1.5

Figure 1
ICRR vs. Demin Water Added During Reactor Coolant System Dilution



3.0 ZERO POWER PHYSICS TESTING

Zero Power Physics Testing (ZPPT) is performed at the beginning of each cycle and is controlled by PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing. Test measurements are made below the Point of Nuclear Heat using the output of one Power Range NIS detector connected to a Westinghouse Advanced Digital Reactivity computer (ADRC). Measurements are compared to predicted data to verify core design. The following tests/measurements are included in the ZPPT program:

- 1/M Approach to Criticality
- Reactivity Computer checkout
- Measurement of Point of Adding Heat
- Control Rod Worth Measurement by Dynamic Rod Worth
- All Rods Out Critical Boron Concentration measurement (Boron Endpoint)
- Isothermal Temperature Coefficient measurement

Zero power physics testing for McGuire 2 Cycle 14 began at 0541 on October 12, 2000 commencing with control bank rod withdrawal for approach to criticality. ZPPT ended at 1457 October 12, 2000. Table 4 summarizes results from ZPPT. All acceptance criteria were met.

Sections 3.1 through 3.6 describe ZPPT measurements and results.

3.1 1/M Approach to Criticality

Initial criticality for McGuire 2 Cycle 14 was achieved per PT/0/A/4150/028, Criticality Following a Change in Core Nuclear Characteristics. In this procedure, an Estimated Critical Rod Position (ECP) is calculated based on latest available Reactor Coolant boron concentration. Control rods are withdrawn 50 to 60 steps at a time while monitoring source range channel response. Inverse Count Rate Ratio (ICRR) is plotted for each source range channel. ICRR data is used to project critical rod position. If projected critical rod position is acceptable, rod withdrawal may continue.

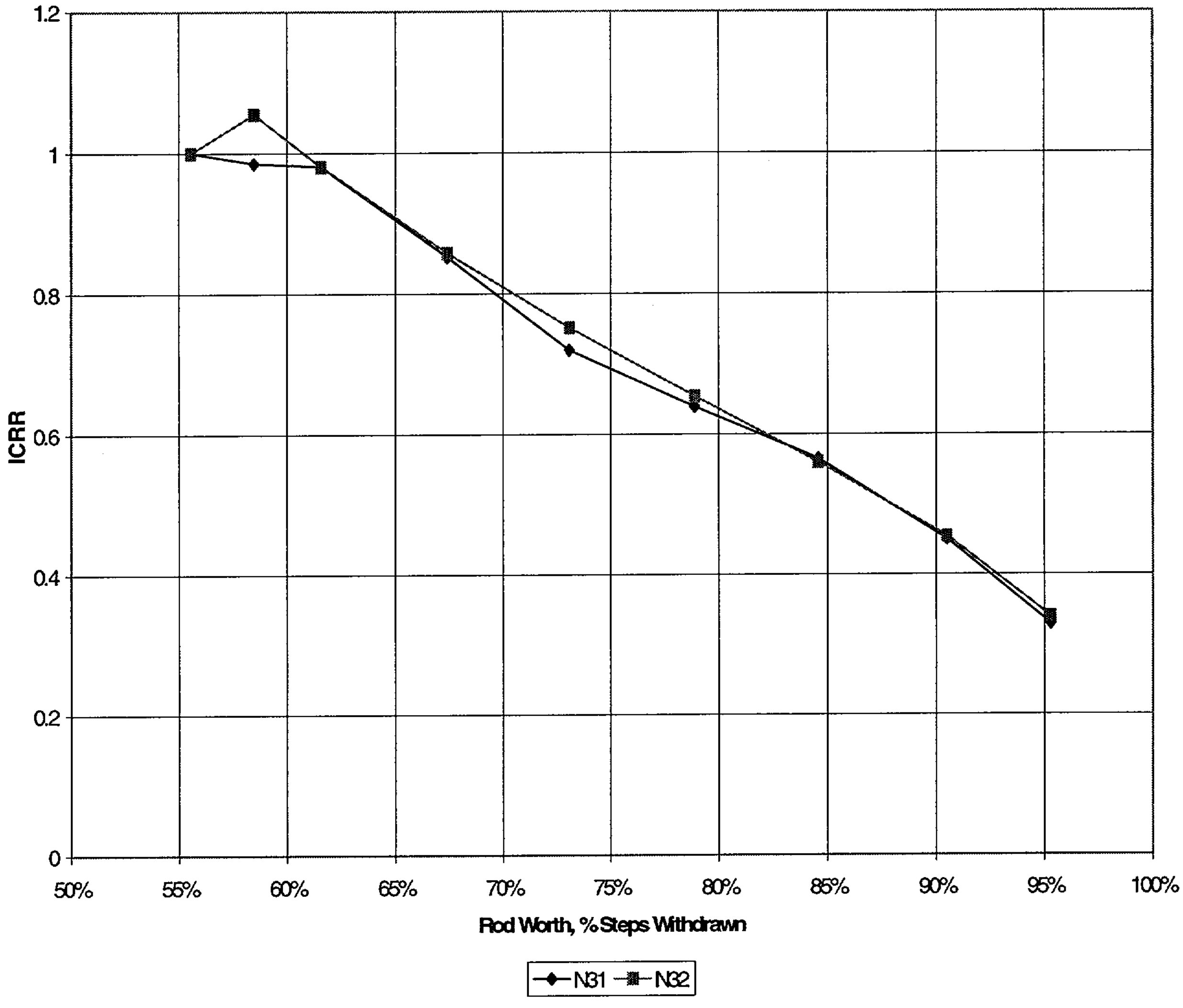
Rod withdrawal for the approach to criticality began at 0552 on October 12, 2000. Criticality was achieved at 0651 on October 12, 2000 with Control Bank D at 191/190 steps withdrawn.

Figure 2 shows the ICRR behavior during the approach to criticality. All acceptance criteria of PT/0/A/4150/028 were met.

TABLE 4
SUMMARY OF ZPPT RESULTS

PARAMETER	MEASURED VALUE	PREDICTED VALUE OR ACCEPTANCE CRITERIA
Nuclear Heat	8.326×10^{-7} amps	N/A
ZPPT Test Band	below 2.497×10^{-7} amps (N41)	N/A
ARO Critical Boron	1691 ppmB	1687 ± 50 ppmB
ITC	-5.35 pcm/°F	-5.24 ± 2 pcm/°F
MTC	-3.670 pcm/°F	-3.56 pcm/°F
Control Bank D Worth	629.1 pcm	639.9 ± 100 pcm
Control Bank C Worth	714.4 pcm	806.4 ± 121 pcm
Control Bank B Worth	643.2 pcm	666.3 ± 100 pcm
Control Bank A Worth	299.1 pcm	351.4 ± 100 pcm
Shutdown Bank E Worth	431.3 pcm	462.6 ± 100 pcm
Shutdown Bank D Worth	488.6 pcm	475.6 ± 100 pcm
Shutdown Bank C Worth	491.3 pcm	474.5 ± 100 pcm
Shutdown Bank B Worth	802.9 pcm	881.7 ± 132 pcm
Shutdown Bank A Worth	280.3 pcm	258.9 ± 100 pcm
Total Rod Worth	4780 pcm	5017.3 ± 522 pcm

FIGURE 2
ICRR vs. CONTROL ROD POSITION DURING APPROACH TO CRITICALITY



3.2 Reactivity Computer Checkout

The reactivity computer checkout was performed per PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing, to verify that the Power Range channel connected to the reactivity computer can provide reliable reactivity data. A reactivity insertion of between +25 and +40 pcm via control rod withdrawal is used to establish a slow, stable startup rate over which determination of Reactor Period is performed by the ADRC. The resulting Period is then used by the ADRC to determine the corresponding Theoretical Reactivity. Measured Reactivity is compared to the Theoretical Reactivity and verified to be within 4.0% or 1.0 pcm (whichever is greater). This evolution is repeated as necessary to ensure compliance with acceptance criterion.

The checkout was performed for McGuire 2 Cycle 14 on October 12, 2000. Results are summarized in Table 5. The acceptance criterion was met with one performance of the checkout.

TABLE 5
REACTIVITY COMPUTER CHECKOUT

Period (seconds)	Theoretical Reactivity (pcm)	Measured Reactivity (pcm)	Absolute Error (pcm)	Absolute Error (%)
166.9	36.3	35.8	0.5	1.35

3.3 Point of Nuclear Heat Addition

The Point of Nuclear Heat Addition is measured by trending Reactor Coolant System temperature, Pressurizer level, flux level, and reactivity while slowly increasing reactor power. A slow, constant startup rate is initiated by rod withdrawal. An increase in Reactor Coolant System temperature and/or Pressurizer level accompanied by a decrease in reactivity as calculated by reactivity computer and/or rate of flux increase indicates the addition of Nuclear Heat.

For Cycle 14, the Point of Nuclear Heat Addition was determined per PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing, on October 12, 2000, Table 6 summarizes the data obtained.

The Zero Power Physics Test Band was automatically set below 2.497×10^{-7} amps on Power Range channel N41 (connected to reactivity computer). Acceptance criterion was satisfied.

TABLE 6
NUCLEAR HEAT DETERMINATION

Power Range Channel N41 Upper, amps	Power Range Channel Lower, amps
4.78375×10^{-7}	3.542654×10^{-7}

3.4 Dynamic Rod Worth Measurement

Using the Westinghouse Advanced Digital Reactivity Computer (ADRC), the reactivity worth of each RCCA Bank is measured using DRWM technique as follows:

- Control Bank D is withdrawn (in MANUAL) to fully withdrawn position.
- Flux level is allowed to increase to just below ZPPT Test Limit.
- First RCCA Bank to be measured is inserted in Bank Select Mode in one continuous motion to a Step Demand Counter Indication ~ 2 steps withdrawn.
- Once the ADRC has signaled that it has acquired sufficient data for measurement, the RCCA Bank is returned to fully withdrawn position.
- The next bank to be tested is then selected and, once flux level has recovered to just below ZPPT Test Limit, the measurement process is repeated.
- This test sequence is repeated until all Control and Shutdown Banks have been measured

The measured worth of each RCCA Bank is verified to be within 15% or 100 pcm (whichever criteria is greater) of predicted worth. The sum of the worths of all banks is verified to be within 8% of the sum of predicted worths. This sum is also verified to be ≥ 90% of predicted total.

The beginning of Cycle 14 rod worth measurements via DRWM were performed on October 12, 2000 per PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing. Results are summarized in Table 4. All acceptance criteria were met.

3.5 ARO Boron Endpoint Measurement

This test is performed at the beginning of each cycle to verify that measured and predicted total core reactivity are consistent. The test is performed in conjunction with Dynamic Rod Worth Measurement. Reactor Coolant System boron samples are obtained at 30 minute intervals during DRWM. The reactivity difference from criticality to the ARO configuration is measured with each bank withdrawal over the course of DRWM. These reactivities are averaged to determine the amount of control rod insertion at critical core conditions. This reactivity is converted to equivalent boron (using the predicted differential boron worth) and added to the average of the boron samples obtained during DRWM to obtain the ARO critical boron concentration.

The Cycle 14 beginning of cycle, hot zero power, all rods out, critical boron concentration was measured on October 12, 2000 per PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing. The ARO, HZP boron concentration was measured to be 1684 ppmB. Predicted ARO critical boron concentration was 1687 ppmB. The acceptance criterion (measured boron within 50 ppmB of predicted) was therefore met.

3.6 ARO Isothermal Temperature Coefficient Measurement

The all rods out (ARO) Isothermal Temperature Coefficient (ITC) is measured at the beginning of each cycle to verify consistency with predicted value. In addition, the Moderator Temperature Coefficient (MTC) is obtained by subtracting the Doppler Coefficient from the ITC. The MTC is used to ensure compliance with Technical Specification limits.

The Isothermal Temperature Coefficient of Reactivity is measured as follows:

- A cooldown of ~ 10 °F/hour is initiated
- Once a constant cooldown rate is established, data gathering on the reactivity computer is initiated.
- After at least 1.1 °F of data is obtained and the error analysis performed by the reactivity computer indicates < 0.1, the cooldown is halted.
- A heatup of ~ 10 °F/hour back to 557 °F is then initiated. Once a constant heat-up rate is established, data gathering on reactivity computer is initiated and subsequently halted when measurement criteria are satisfied.

Control rod motion is limited to that required to maintain flux below the testing limit. The cooldown/heatup cycle is repeated if additional data is required.

The beginning of cycle 14 ITC was measured per PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing, on October 12, 2000. Average ITC was determined to be -5.35 pcm/°F. Predicted ITC was -5.24 pcm/°F. Measured ITC was therefore within acceptance criterion of predicted ITC ± 2 pcm/°F.

The MTC was determined to be -3.67 pcm/°F. Due to implementation of Integral Fuel Burnable Absorbers, the poison burnout rate resulted in an increase in operating cycle boron concentration during the beginning of cycle. Since this change did not necessarily yield the most limiting condition for the cycle; the limiting MTC was applying appropriate correction to the procedure evaluation performed during measurement of the MTC. Compliance with Technical Specification 3.1.3 and SR 3.1.3.1 was ensured without performance of procedure PT/0/A/4150/031, Determination of Rod Withdrawal Limits to Ensure Moderator Temperature Coefficient within Limits of Technical Specifications. Performance of this procedure was waived per PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing.

TABLE 7
ITC MEASUREMENT RESULTS

	Average Temperature (°F)	**ITC (pcm/°F)**
Cooldown	557.1	-5.12
Heatup	556.9	-5.58
Average	557.0	-5.35

4.0 POWER ESCALATION TESTING

Power Escalation Testing is performed during the initial power ascension to full power for each cycle and is controlled by PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing. Tests are performed from 0% through 100% power with major testing plateaus at ~30%,~76%, and 100% power.

Significant tests performed during McGuire 2 Cycle 14 Power Escalation were:

- Core Power Distribution (at ~30%, ~76%, and 100% power)
- One-Point Incore/Excore Calibration (at ~30% power)
- Reactor Coolant Delta Temperature Measurement (at 90% and 100% power)
- Hot Full Power Critical Boron Concentration Measurement (at 100% power)
- Incore/Excore Calibration (at 100% power)
- Evaluation of Intermediate Range NIS Rod Stop and Reactor Trip Setpoints

Power Escalation Testing for McGuire 2 Cycle 14 began on October 12, 2000. The unit reached 100% RTP on October 16, 2000. Sections 4.1 through 4.6 describe the significant tests performed during power escalation and their results.

4.1 Core Power Distribution

Core power distribution measurements are performed during power escalation at low power (approximately 30%), intermediate power (approximately 76%), and full power. Measurements are made to verify flux symmetry and to verify core peaking factors are within allowable limits. Data obtained during this test is also used to check calibration of Power Range NIS channels and to calibrate them if required Measurements are made using the Moveable Incore Detector System and analyzed using Duke Power's COMET code (adapted from the Shangstrom Nuclear Associates' CORE package and the FCF MONITOR code).

The McGuire 2 Cycle 14 Core Power Distribution measurements were performed on October 13, 2000 (29% power), October 15, 2000 (76% power), and October 20, 2000 (100% power). Tables 8 through 10 summarize the results. All acceptance criteria were met.

TABLE 8
CORE POWER DISTRIBUTION RESULTS
30% POWER

Plant Data

Map ID:	m2c14f001b
Date of Map:	October 13, 2000
Cycle Burnup:	0.2 EFPD
Power Level:	28.90% F.P.
Control Rod Position:	Control Bank D at 186 Steps Wd
Reactor Coolant System Boron Concentration:	1534 ppmB

COMET Results

Core Average Axial Offset:	-1.731%
Tilting Factors for Entire Core Height: Quadrant 1:	1.00371
Quadrant 2:	0.99312
Quadrant 3:	1.00798
Quadrant 4:	0.99519
Maximum F_Q (nuclear):	1.820
Maximum $F_{\Delta H}$ (nuclear):	1.571
Maximum Error between Pred. and Meas $F_{\Delta H}$:	10.72%
Mean Error between Pred. and Meas. $F_{\Delta H}$:	3.04%
Maximum Error between Expected and Measured Detector Response :	11.09%
RMS of Errors between Expected and Measured Detector Response:	3.95%

MONITOR Results

Minimum F_Q LCO Margin:	59.16%
Minimum $F_{\Delta H}$ LCO Margin:	26.19%

TABLE 9
CORE POWER DISTRIBUTION RESULTS
76% POWER

Plant Data

Map ID:	m2c14f002
Date of Map:	October 15, 2000
Cycle Burnup:	0.8 EFPD
Power Level:	76.09% F.P.
Control Rod Position:	Control Bank D at 210 Steps Wd
Reactor Coolant System Boron Concentration:	1279 ppmB

COMET Results

Core Average Axial Offset:	-2.546%
Tilting Factors for Entire Core Height: Quadrant 1:	0.99558
Quadrant 2:	1.00154
Quadrant 3:	1.00345
Quadrant 4:	0.99943
Maximum F_Q (nuclear):	1.706
Maximum $F_{\Delta H}$ (nuclear):	1.451
Maximum Error between Pred. and Meas $F_{\Delta H}$:	6.80%
Mean Error between Pred. and Meas. $F_{\Delta H}$:	2.09%
Maximum Error between Expected and Measured Detector Response:	7.18%
RMS of Errors between Expected and Measured Detector Response:	3.06%

MONITOR Results

Minimum F_Q LCO Margin:	43.86%
Minimum $F_{\Delta H}$ LCO Margin:	23.70%

TABLE 10
CORE POWER DISTRIBUTION RESULTS
100% POWER

Plant Data

Map ID:	m2c14f003
Date of Map:	October 20, 2000
Cycle Burnup:	5.9 EFPD
Power Level:	99.81% F.P.
Control Rod Position:	Control Bank D at 218 Steps Wd
Reactor Coolant System Boron Concentration:	1084 ppmB

COMET Results

Core Average Axial Offset:	-6.249%
Tilting Factors for Entire Core Height: Quadrant 1:	0.99169
Quadrant 2:	1.00143
Quadrant 3:	1.00149
Quadrant 4:	1.00540
Maximum F_Q (nuclear):	1.777
Maximum $F_{\Delta H}$ (nuclear):	1.445
Maximum Error between Pred. and Meas $F_{\Delta H}$:	5.99%
Mean Error between Pred. and Meas. $F_{\Delta H}$:	1.58%
Maximum Error between Expected and Measured Detector Response:	6.31%
RMS of Errors between Expected and Measured Detector Response:	2.21%

MONITOR Results

Minimum F_Q Operational Margin:	2.47%
Minimum F_Q RPS Margin:	9.57%
Minimum F_Q LCO Margin:	23.39%
Minimum $F_{\Delta H}$ Surveillance Margin:	5.42%
Minimum $F_{\Delta H}$ LCO Margin:	19.78%

4.2 One-Point Incore/Excore Calibration

PT/0/A/4600/002F, One-Point Incore/Excore Calibration, is performed using results of Power Range NIS data taken at 30% power and the incore axial offset measured at 30%. Power Range channels are calibrated before exceeding 50% in order to have valid indications of Axial Flux Difference and Quadrant Power Tilt Ratio for subsequent power ascension. The calibration is checked using the intermediate power level flux map (76% F.P. for M2C14). If necessary, Power Range NIS is recalibrated per PT/0/A/4600/002F or PT/0/A/4600/002G, Incore and NIS Recalibration.

Data for McGuire 2 Cycle 14 was obtained on October 13, 2000 and all Power Range NIS calibrations were completed. All acceptance criteria were met. Results are presented in Table 11.

TABLE 11
ONE-POINT INCORE/EXCORE CALIBRATION RESULTS

Reactor Power = 29.0140
Axial Offset = -1.731%

Measured Power Range Currents, μAmps

	N41	N42	N43	N44
Upper	43.7	68.0	57.2	61.1
Lower	51.2	78.3	68.4	71.0

New Calibration Currents, μAmps

Axial Offset, %	N41		N42		N43		N44	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
+30	186.5	135.1	289.3	210.4	240.5	182.2	258.5	191.9
0	152.6	174.2	237.4	266.6	199.5	232.8	213.2	241.8
-30	118.6	213.3	185.5	322.9	158.6	283.5	167.9	291.7

4.3 Reactor Coolant Loop Delta Temperature Measurement

Reactor Coolant System (NC) Hot Leg and Cold Leg temperature data is normally obtained at approximately 87% and 100% power per PT/0/A/4150/040, NC Loop Delta-T, RTAS, and OPDT &OTDT Channel Check Criteria Evaluation, to ensure that full power delta temperature constants (ΔT_0) are valid. ΔT_0 is used in the Over-power and Over-temperature Delta Temperature reactor protection functions.

In the case of M2C14, loop ΔT_0's were evaluated at 90% F.P. on October 15, 2000 three loops required gain adjustments. Power ascension proceeded to 100% F.P. where the ΔT_0's were re-evaluated. All acceptance criteria were met.

4.4 Hot Full Power Critical Boron Concentration Measurement

The Hot Full Power critical boron concentration is measured using PT/0/A/4150/004, Reactivity Anomalies Calculation. Reactor Coolant boron concentration is measured (average of three samples) with reactor at essentially all rods out, Hot Full Power, equilibrium xenon conditions. The measured boron is corrected for any off-reference condition (e.g. inserted rod worth, temperature error, difference from equilibrium xenon) and compared to predicted value.

For McGuire 2 Cycle 14, the Hot Full Power critical boron concentration was measured on October 20, 2000. The measured critical boron concentration was 1082 ppmB. Predicted HFP critical boron concentration was 1085 ppmB. The ARO Boron Endpoint Measurement during ZPPT yielded a measured HZP Boron Concentration of 1691 ppmB (prediction being 1687 ppmB). The predicted ΔBoron was therefore 602 ppmB, while the measured ΔBoron was 609 ppmB. The difference of 7 ppmB between these two parameters easily satisfied the acceptance criterion.

4.5 Incore/Excore Calibration

Excore NIS Power Range channels are calibrated at full power per PT/0/A/4600/002G, Incore and NIS Recalibration. Incore data (flux maps) and Power Range NIS currents are obtained at various axial power distributions. A least squares fit of the output of each detector (upper and lower chambers) as a function of measured incore axial offset is determined. The slopes and intercepts of the fit for the upper and lower chamber for each channel are used to determine calibration data for that channel.

This test was performed for McGuire 2 Cycle 14 on October 20 - 21, 2000. Nine flux maps, with axial offset ranging from -12.466% to 3.665% were used. Table 12 summarizes the results. All acceptance criteria were met.

TABLE 12
INCORE/EXCORE CALIBRATION RESULTS

Full Power Currents, Microamps

Axial Offset, %	N41		N42		N43		N44	
	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
+30%	199.2	139.0	308.0	215.0	257.3	187.7	275.0	196.2
0%	162.6	178.2	252.4	272.7	212.3	239.0	226.9	248.4
-30%	126.0	217.5	196.8	330.4	167.2	290.2	178.9	300.6

Correction (M_J) Factors

N41	N42	N43	N44
1.347	1.389	1.406	1.422

4.6 Intermediate Range NIS Setpoint Evaluation

PT/0/A/4150/021, Post Refueling Controlling Procedure for Criticality, Zero Power Physics, and Power Escalation Testing, performs an evaluation of Intermediate Range NIS response in comparison to 20% (Rod Stop) and 25% F.P. (Reactor Trip). This evaluation acquires N35 and N36 indication data as close to 25% Thermal Power as possible. The extrapolated channel responses are then compared to the installed 25% F.P. I/R NIS Reactor Trip setpoints to ensure existing setpoints do not exceed the channels' indication at 30% F.P. This verifies that the Reactor Trip setpoints have been established conservatively enough to ensure compliance with allowable Technical Specifications, tolerance on this Reactor Protection function.