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July 7, 2005

U. S. Nuclear Regulatory Commission
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Subject: McGuire Nuclear Station
Docket Nos. 50-370
Steam Generator In-Service Inspection Report
Unit 2, End of Cycle (EOC) 16

Pursuant to ASME Section XI, Paragraph IWA-6230, Duke Energy Corporation hereby submits the attached Inservice Inspection (ISI) Outage Summary Report for McGuire Unit 2 EOC 16.

Questions regarding this submittal should be directed to Kay Crane, McGuire Regulatory Compliance (704) 875-4306.

Gary R. Peterson

Attachment

U. S. Nuclear Regulatory Commission
Document Control Desk
July 7, 2005
Page 2

cc: W. D. Travers
U. S. Nuclear Regulatory Commission
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Atlanta Federal Center
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Washington, DC 20555-0001

Joe Brady
Senior Resident Inspector (MNS)
U. S. Nuclear Regulatory Commission

Steam Generator Outage Summary Report

McGuire Unit 2 2005 Outage EOC 16

Location: 12700 Hagers Ferry Rd, Huntersville, NC 28078

NRC Docket No. 50-370

National Board No. 84

Commercial Service Date: March 1, 1984

Owner: Duke Energy Corporation
526 South Church St.
Charlotte, N.C. 28201-1006

Revision 0

Prepared By:  Date: 6/29/05

Reviewed By:  Date: 6-29-05

Approved By:  Date: 6-29-05

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Inspection and Insurance
Corporation (AIA)

3

State of North Carolina
Department of Labor
C/o J. M. Givens, Jr.

FORM NIS-1 OWNER'S DATA REPORT FOR INSERVICE INSPECTIONS

As required by the Provisions of the ASME Code Rules

1. Owner: Duke Energy Corporation, 526 S. Church St., Charlotte, NC 28201-1006
(Name and Address of Owner)
2. Plant: McGuire Nuclear Station, 12700 Hagers Ferry Rd, Huntersville, NC 28078
(Name and Address of Plant)
3. Plant Unit: 2
4. Owner Certificate of Authorization (if required) N/A
5. Commercial Service Date: March 1, 1984
6. National Board Number for Unit 84
7. Components Inspected:

<u>Component</u>	<u>Manufacturer</u>	<u>Manufacturer Serial No.</u>	<u>State or Province No.</u>	<u>National Board No.</u>
Steam Generator 2A	BWI	7700-02	NC-302674	159
Steam Generator 2B	BWI	7700-04	NC-302675	161
Steam Generator 2C	BWI	7700-01	NC-302676	158
Steam Generator 2D	BWI	7700-03	NC-302677	160

Note: Supplemental sheets in form of lists, sketches, or drawings may be used provided (1) size is 8¹/₂ in. x 11 in., (2) information in items 1 through 6 on this data report is included on each sheet, and (3) each sheet is numbered and the number of sheets is recorded at the top of this form.

FORM NIS-1 (Back)

- 8. Examination Dates March 16, 2005 to April 1, 2005
- 9. Inspection Period Identification: 1st Period
- 10. Inspection Interval Identification: 3rd Inspection Interval
- 11. Applicable Edition of Section XI 1998 Addenda 2000
- 12. Date/Revision of Inspection Plan: March 1st, 2004 Rev 0

13. Abstract of Examinations and Test. Reference attached Eddy Current Examination Technical Summary Rev 1 report dated 6/22/05.

14. Abstract of Results of Examination and Tests. Reference attached Eddy Current Examination Technical Summary Rev 1 report dated 6/22/05.

15. Abstract of Corrective Measures. Reference attached Eddy Current Examination Technical Summary report Rev 1 dated 6/22/05.

We certify that a) the statements made in this report are correct b) the examinations and tests meet the Inspection Plan as required by the ASME Code, Section XI, and c) corrective measures taken conform to the rules of the ASME Code, Section XI.

Certificate of Authorization No. (if applicable) NA Expiration Date NA

Date 6/29 20 05 Signed Duke Energy Corp. By R. Brand
Owner

CERTIFICATE OF INSERVICE INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and the State of Province of NC employed by HSBCT of CONNECTICUT have inspected the components described in this Owners' Report during the period 10/6/2003 to 4/14/2005, and state that to the best of my knowledge and belief, the Owner has performed examinations and tests and taken corrective measures described in the Owners' Report in accordance with the Inspection Plan and as required by the ASME Code, Section XI.

By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the examinations, test, and corrective measures described in this Owners' Report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection

Jerome F. Fwan Commissions NC 1524 "N" I
Inspector's Signature National Board, State, Province, and Endorsements

Date 7/6 20 05



ENGINEERING INFORMATION RECORD

Document Identifier 51 - 5064658 - 01

Title McGuire Nuclear Station Unit 2 EOC16 Eddy Current Examination Technical Summary

PREPARED BY:

REVIEWED BY:

Name Jeffrey C. Grigsby

Name Dennis Greene

Signature *J. Grigsby* Date 6-22-05

Signature *D. Greene* Date 6-22-05

Technical Manager Statement: Initials *WMB 6-22-05*

Reviewer is Independent. *WMB*

Remarks:

This report summarizes the results of the eddy current examinations performed on the tubes in all four steam generators at Duke Power Company's McGuire Nuclear Station Unit 2 during the 16th refueling outage (EOC16)

1.0 Introduction

Eddy current examinations were performed on the .688" O.D. x 0.040" wall Inconel 690 tubing in all four steam generators during McGuire's Nuclear Station's Unit 2 Refueling Outage sixteen (16).

2.0 Technical Summary

This section provides a technical summary of the eddy current examinations performed at Duke Energy's McGuire Nuclear Station Unit 2 Refueling Outage sixteen (16).

McGuire Unit 2 has the following design characteristics: 1,180 MW Pressurized Water Reactor (PWR) Westinghouse 4 loop Nuclear Steam Supply System (NSSS). The steam generators are Babcock & Wilcox International (BWI) CFR80 vertical U-bent type containing 6,633 tubes each. Personnel from FANP performed the examinations during the 16th refueling outage.

A .540" diameter tuned bobbin coil and ^{DO} array coil combination probe was used to perform a full length examination of 6630 tubes in steam generator A, 3760 tubes in steam generator B, 3834 tubes in steam generator C and 6629 tubes in steam generator D. The array coil data was utilized for the top of tubesheet examinations of 2008 tubes in steam generator A, 1908 tubes in steam generator B, 1892 tubes in steam generator C and 1989 tubes in steam generator D. The array coil data was utilized for possible loose parts (PLP) examination of 814 tubes in steam generator A, 814 tubes in steam generator B, 814 tubes in steam generator C, and 814 tubes in steam generator D. All existing plugs were visually inspected with no indications of leakage present. 17 tubes were removed from service in steam generator A; no tubes were removed from service in steam generators B, C and D.

2.1 Summary

The following summarizes the results of eddy current examinations for all four steam generators.

Note: Attachment 1 contains a list of all three-letter codes and acronyms used throughout this report. Attachment 2 contains the eddy current results from all four CFR80 steam generators for McGuire Unit 2 Refueling Outage 16.

A S/G:

- Eddy current examinations began on 3/16/05 @ 0153 and were completed on 3/25/05 @ 0255.
- 6630 tubes were examined with a bobbin coil probe.
- 1 tube was reported to have indications of 40% TW or greater with the bobbin or array coil probes.
- 7 tubes were reported to have 8 indications of 20 - 39% TW or greater with the bobbin or array coil probes.
- 170 tubes were examined for Special Interest Locations.
- 2008 Hot leg top-of-tubesheets were examined from the tube end to 2" above the tubesheet.
- 814 Periphery hot leg top-of-tubesheets were examined for possible loose parts (PLP).
- 13 tubes were removed from service by plugging based on the eddy current results.
- 4 tubes were removed from service due to inadvertent tube end repair.
- See Attachment 2 for details.

B S/G:

- Eddy current examinations began on 3/16/05 @ 1926 and were completed on 3/24/05 @ 0131.
- 3760 tubes were examined with a bobbin coil probe.
- 0 tubes were reported to have indications of 40% TW or greater with the bobbin or array coil probes.
- 0 tubes were reported to have indications of 20 - 39% TW or greater with the bobbin or array coil probes.
- 24 tubes were examined for Special Interest Locations.
- 1908 Periphery hot leg top-of-tubesheets were examined from the tube end to 2" above the tubesheet.
- 814 Hot legs top-of-tubesheets were examined for possible loose parts (PLP).
- 0 tubes were removed from service by plugging.
- See Attachment 2 for details.

C S/G:

- Eddy current examinations began on 3/16/05 @ 1813 and were completed on 3/24/05 @ 0332.
- 3834 tubes were examined with a bobbin coil probe.
- 0 tubes were reported to have indications of 40% TW or greater with the bobbin or array coil probes.
- 1 tube was reported to have 1 indication of 20 - 39% TW or greater with the bobbin or array coil probes.
- 190 tubes were examined for Special Interest Locations.
- 1892 Hot leg top-of-tubesheets were examined from the tube end to 2" above the tubesheet.
- 814 Periphery hot legs top-of-tubesheets were examined for possible loose parts (PLP).
- 0 tubes were removed from service by plugging.
- See Attachment 2 for details.

D S/G:

- Eddy current examinations began on 3/16/05 @ 0220 and were completed on 3/24/05 @ 2231.
- 6629 tubes were examined with a bobbin coil probe.
- 0 tubes were reported to have indications of 40% TW or greater with the bobbin or array coil probes.
- 1 tubes was reported to have 1 indication of 20 - 39% TW or greater with the bobbin or array coil probes.
- 126 tubes were examined for Special Interest Locations.
- 1989 Hot leg top-of-tubesheets were examined from the tube end to 2" above the tubesheet.
- 814 Periphery hot legs top-of-tubesheets were examined for possible loose parts (PLP)
- 0 tubes were removed from service by plugging.
- See Attachment 2 for details.

2.2 Examinations

The examinations, analysis, equipment and personnel were in compliance with the requirements of the FANP Multi-Frequency Eddy Current Examination of Tubing (ISI-400) latest revision, Written Practice for Personnel Qualification in Eddy Current Examination (ISI-24) latest revision, Eddy Current Acquisition Guidelines for Duke Power Company's CFR80 Steam Generator and Eddy Current Analysis Guidelines for Duke Power Company's CFR80 Steam Generators.

The steam generator tubing examinations were performed by technicians qualified to Level II, IIA, or Level I under direct supervision of personnel qualified to Level II in accordance with FANP procedure ISI-24, latest revision. The data was evaluated by personnel qualified to a minimum of Level IIA in accordance with FANP procedure ISI-24, latest revision. The examination and evaluation procedures and guidelines were reviewed and approved by personnel qualified to Level III in accordance with FANP procedure ISI-24, latest revision. All inspection frequencies were generated using a Zetec TC-7700 remote data acquisition unit.

The bobbin and array coil examinations were performed with 0.540" diameter probes. The inspection frequencies used were 650, 320, 170 and 70 kHz operating in differential and absolute modes. A 650/170 kHz differential tube support plate suppression mix was used to enhance the detection of indications occurring at TSP and TS intersections.

The special interest examinations were performed with 0.540" diameter array probes. The inspection frequencies were 650, 320, 170 and 70 kHz. A 320/170 kHz tube support plate suppression mix was used to enhance the detection of indications occurring at TSP and TS intersections.

Official results of the data analysis were recorded on optical disks and verified by two Eddy Current Data management systems: Framatome Data Management System, (FDMS) and EddyNet Inspection management System, (EIMS). These systems were used to check the data results for invalid analysis entries, perform data sorting routines, and ensure all the required tubes were examined.

2.3 Areas of Concern

Eddy current examinations cannot, in all cases, determine the actual cause of damage. The signal recorded during the eddy current examination can be used to estimate the physical size of any tube damage detected, i.e. penetration into the wall, axial extent. However the actual type of degradation and its cause can only be determined by tube removal and metallurgical studies.

- 2.3.1 Loose Parts - Loose parts, or damage attributed to loose parts impact or fretting, may be present adjacent to tubes in the periphery. Indications of loose parts and damage associated with loose parts have been detected in the CFR80 Steam Generators.
- 2.3.2 Mechanical Wear – Indications indicative of TSP or FB wear have been identified and reported in the CFR80 Steam Generators. Analysts were trained for wear type indications and reported indications indicative of wear in accordance with the guidelines.
- 2.3.3 Tube-to-Tube Contact – Tube-to-Tube contact/proximity has been identified as an area of concern for the CFR80 replacement steam generators. A number of tubes in the CFR80 design steam generators have been identified as representative of tubes that are in close proximity. The area of concern is the entire u-bend area were monitored for indications indicative of degradation. Any indications indicative of tube-to-tube contact wear shall be reported in accordance with the guidelines.

2.4 Results

Attachment 2 details the results of the various eddy current examinations performed in all four Steam Generator's.

Attachment 1

Bobbin Characterization Codes

<u>#</u>	<u>CODE</u>	<u>DESCRIPTION</u>
1	ADI	Absolute Drift Indication
2	BLG	Bulge
3	BOR	Boron
4	CHI	Chatter
5 *	CHG	Historical comparison has been performed and indication has Changed based on the criteria
6	DNI	Dent
7	DWI	Dent With Indication
8	FC	Final Calibration
9	FCL	Final Calibration Late
10	HNI	Historical comparison has been performed and indication has Not changed based on the criteria
11	ICR	Incomplete Roll
12	IC	Initial Calibration
13	IV	Independent Verification of tube identification
14 *	IDOK	Tube ID Verified; This code shall be used to identify tubes acquired more than once during the current outage Use of this code requires tube to tube comparison or fingerprinting of the affected tube(s)
15	INF	Indication Not Found
16	INR	Indication Not Reportable
17	IRR	Irregular Roll
18 *	L3R	Level III Review
19	MSG	Analyst Message
20	NEX	No Expansion
21	NFC	No Final Calibration
22	NQI	Non-Quantifiable Indication
23	NSR	Needs SGME Review
24	OBS	Obstructed
25	OVR	Over Roll
26	EXP	Over Expansion
27	PID	Positive Identification
28 *	PLG	Plugged Tube
29	PLP	Possible Loose Parts
30	PVN	Permeability Variation
31	RBD	Retest - Bad Data
32	RFB	Retest - Fan Bar using a wear standard for sizing
33	RIC	Retest - Incomplete
34	RNC	Retest - Tube Number Check
35	ROB	Retest - Obstructed
36	RRC	Retest - Rotating Coil
37	RPD	Retest - Positive Identification
38	SAT	Satisfactory
39	SLG	Sludge
40	SKR	Skip Roll
41 *	WAR	Wear
42	WTG	Wetting/Leaking

* Denotes code to be used in the "UTIL 1" field

MRPC/Array Characterization Codes

<u>#</u>		<u>CODE</u>	<u>DESCRIPTION</u>
1	*	AXI	Axial Indication
2		DNI	Dent
3		DPS	Potential Deposit at Support structures
4	*	L3R	Level III Review
5		MAI	Multiple Axial Indication
6		MCI	Multiple Circumferential Indication
7		MMI	Mixed-Mode Indication
8		MSG	Analyst Message
9		MVI	Multiple Volumetric Indications
10		NDF	No Defect Found
11	+	NQS	Non-Quantifiable Signal
12		OBS	Obstructed
13		PID	Positive Identification
14		PLP	Possible Loose Part
15		PVN	Permeability Variation
16		RBD	Retest - Bad Data
17		RIC	Retest - Incomplete
18		RNC	Retest - Tube Number Check
19		ROB	Retest - Obstructed
20		SAI	Single Axial Indication
21		SCI	Single Circumferential Indication
22		SVI	Single Volumetric Indication
23		VOL	Volumetric
24	*	WAR	Wear

- * Denotes code to be used in the "UTIL 1" field.
- + Code for Resolution analysts only.

Attachment 2

McGuire Unit 2 EOC 16 CFR80 Eddy Current Results

Bobbin Examinations

	Steam Generator "A" Tubes Tested: 6630		Steam Generator "B" Tubes Tested: 3760	
	Tubes with Indications	Number of Indications	Tubes with Indications	Number of Indications
TWD > 40%	1	1	0	0
TWD 20-39%	7	8	0	0
TWD < 20%	58	63	33	36
ADI	23	23	5	5
DNT	1	2	0	0
HNI	14	16	17	17
INF	0	0	0	0
INR	3	3	6	7
NQI	4	4	0	0
PLP	24	29	7	13
PVN	0	0	0	0

	Steam Generator "C" Tubes Tested: 3834		Steam Generator "D" Tubes Tested: 6629	
	Tubes with Indications	Number of Indications	Tubes with Indications	Number of Indications
TWD > 40%	0	0	0	0
TWD 20-39%	1	1	0	0
TWD < 20%	62	63	50	58
ADI	12	14	7	7
DNT	4	5	0	0
HNI	10	12	6	8
INF	19	20	0	0
INR	7	10	1	1
NQI	1	1	3	3
PLP	64	78	17	19
PVN	0	0	0	0

Special Interest: including PLP bounding, HL-TTS examinations and Periphery PLP examinations.

	Steam Generator "A" Tubes Tested: 2992		Steam Generator "B" Tubes Tested: 2746	
	Tubes with Indications	Number of Indications	Tubes with Indications	Number of Indications
Fan Bar Wear	52	59	31	34
TSP Wear	8	9	2	2
Loose Part Wear	5	7	0	0
DNT	1	2	0	0
MAI	0	0	0	0
MCI	0	0	0	0
MMI	0	0	0	0
MVI	0	0	0	0
PLP	24	29	7	13
SAI	0	0	0	0
SCI	0	0	0	0
SVI	9	9	0	0
VOL	38	40	7	9

	Steam Generator "C" Tubes Tested: 2896		Steam Generator "D" Tubes Tested: 2929	
	Tubes with Indications	Number of Indications	Tubes with Indications	Number of Indications
Fan Bar Wear	63	64	51	59
TSP Wear	0	0	0	0
Loose Part Wear	0	0	0	0
DNT	4	5	0	0
MAI	0	0	0	0
MCI	0	0	0	0
MMI	0	0	0	0
MVI	0	0	0	0
PLP	64	78	17	19
SAI	0	0	0	0
SCI	0	0	0	0
SVI	0	0	0	0
VOL	10	12	18	19