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May 13, 1998

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Mr. A. B. Beach **Regional Administrator** Nuclear Regulatory Commission Region III 801 Warrenville Road Lisle, IL 60532-4351

- ComEd Braidwood Station Unit 1 Sixth Refuel Outage Subject: Steam Generator Inservice Inspection Report Docket No. STN 50-456
- ComEd Letter to U.S. Nuclear Regulatory Commission from T. J. Tulon. Reference: "ComEd Braidwood Station Unit 1 Sixth Refuel Outage Steam Generator Inservice Inspection Report," Docket No. STN 50-456, dated May 29, 1997

Braidwood Station Technical Specification 4.4.5.5.b requires that within 12 months following the completion of each inservice inspection of steam generator tubes, the complete results of the inspection shall be submitted to the Commission in a Special Report pursuant to Specification 6.9.2. This report shall include the number and extent of tubes inspected, location and percentage of wall-thickness penetration for each indication of an imperfection, and identification of tubes plugged or repaired. The Braidwood Unit 1 steam generator eddy current inspection was completed May 16, 1997.

During the Braidwood Unit 1 Cycle 6 Refuel Outage, which began March 29, 1997, an eddy current inspection of the steam generator tubing was conducted. The inspection consisted of the following:

- Bobbin coil probe inspection of 100% of the inservice tubes (full length). .
- · 3-coil rotating Plus Point Probe inspection of the hot-leg top of-tubesheet roll transition region of 100% of the non-sleeved inservice tubes.
- · 3-coil rotating Plus Point Probe inspection of the cold-leg top-of-tubesheet roll transition region of 100% of the inservice tubes.
- Rotating Plus Point Probe inspection of 100% of the Row 1 and 2 U-Bend regions.
- 3-coil rotating Plus Point Probe inspection of Tube Support Plate intersections required by NRC Generic Letter 95-05 for the implementation of 3.0 Volt Interim Plugging Criteria.
- 3-coil Plus Point Probe inspection of 25% of the expanded tubes at Preheater Baffles "B" and "D" in the 1B Steam Generator.
- Rotating Plus Point Probe inspection of 100% of the 12" Laser Welded Sleeves (full length) installed at the hot-leg top-of-tubesheet region. TEO!



Mr. A. B. Beach May 13, 1998 Page 2

- 3-coil rotating Plus Point Probe inspection of the hot-leg top-of-tubesheet roll transition region of 100% of the "Locked Tubes" required to support 3.0 Volt Interim Plugging Criteria.
- Rotating Gimballed Plus Point Probe inspection of 100% of the expansions at the "Locked Tube" support plate intersections. This inspection also included 100% of the non-locked tube support plate intersections below the highest "Locked Tube" support plate.

The 3-coil rotating Plus Point Probe consisted of the Plus Point Coil. a 0.080 inch Pancake Coil, and a 0.115 inch Pancake Coil. The eddy current data was analyzed using Zetec Eddynet software.

Enclosed is the summary inspection report. This summary is consistent with that provided in the 15-day inspection report (Reference). Attachments to the report include tube plugging results (Attachment 1), a guide to the abbreviations used in the indication list (Attachment 2), the list of eddy current indications (Attachment 3), and tubesheet maps and repair lists (Attachment 4).

Please direct any questions regarding this submittal to Terry Simpkin, Braidwood Regulatory Assurance Supervisor, (815) 458-2801, extension 2980.

Sincerely,

Timothy J. Tulon Site Vice President Braidwood Nuclear Generating Station

Attachments

 C. J. Phillips, Braidwood Senior Resident Inspector S. Bailey, Braidwood Project Manager - NRR J. Schapker, Region III Illinois Department of Nuclear Safety Document Control Desk - U.S. NRC

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## **ComEd BRAIDWOOD NUCLEAR STATION**

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# UNIT 1 SIXTH REFUEL OUTAGE (APRIL 1997)

### STEAM GENERATOR INSERVICE INSPECTION RESULTS

### TABLE OF CONTENTS

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SECTION	DESCRIPTION	PAGE
1.0	Introduction	1
2.0	Inspection Plan	1
3.0	Inspection Techniques	1
4.0	Inspection Results	2
5.0	Certifications	2
Attachment 1	Braidwood Unit 1 Sixth Refuel Outage (A1R06) SG Tube Plugging Results	
Attachment 2	Supertubin Report User's Guide (Guide to Abbreviations)	
Attachment 3	Steam Generator Eddy Current Results	
Attachment 4	Eddy Current Results of Steam Generator Tubes That Were Plugged / Sleeved A1R06	

#### 1.0 INTRODUCTION

4

Braidwood Unit 1 is a four loop PWR with Westinghouse Model D-4 Steam Generators (SG). There are 4.578 tubes in each SG. The tubes are mill annealed Inconel Alloy 600 U-Tubes with an outside diameter of 0.750 inches and a nominal thickness of 0.043 inches.

During the scheduled Braidwood Unit 1 sixth refuel outage in March through May of 1997. SG eddy current examinations were conducted by Westinghouse Nuclear Services Division in compliance with Braidwood Technical Specification 3/4.4.5 and ASME Section XI.

#### 2.0 INSPECTION PLAN

All four SG's were tested in parallel from the hot leg and cold leg channel heads. The inspection scope consisted of the following:

- Bobbin coil probe inspection of 100% of the inservice tubes (full length).
- 3-coil rotating Plus Point Probe inspection of the hot-leg top-of-tubesheet roll transition region of 100% of the non-sleeved inservice tubes.
- 3-coil rotating Plus Point Probe inspection of the cold-leg top-of-tubesheet roll transition region of 100% of the inservice tubes.
- Rotating Plus Point Probe inspection of 100% of the Row 1 and 2 U-Bend regions.
- 3-coil rotating Plus Point Probe inspection of Tube Support Plate intersections required by NRC Generic Letter 95-05 for the implementation of 3.0 Volt Interim Plugging Criteria.
- 3-coil Plus Point Probe inspection of 25% of the expanded tubes at Preheater Baffles "B" and "D" in the 1B Steam Generator.
- Rotating Plus Point Probe inspection of 100% of the 12" Laser Welded Sleeves (full length) installed at the hot-leg top-of-tubesheet region.
- 3-coil rotating Plus Point Probe inspection of the hot-leg top-of-tubesheet roll transition region of 100% of the "Locked Tubes" required to support 3.0 Volt Interim Plugging Criteria.
- Rotating Gimballed Plus Point Probe inspection of 100% of the expansions at the "Locked Tube" support plate intersections. This inspection also included 100% of the non-locked tube support plate intersections below the highest "Locked Tube" support plate.

#### 3.0 INSPECTION TECHNIQUES

The eddy current examinations were conducted from both the hot leg and cold leg channel heads. Bobbin inspection was performed using a 0.610 inch bobbin coil eddy current probe. The bobbin probe withdrawal speed was twenty-four inches per second (maximum). All bobbin coil examinations were performed utilizing frequencies of 550

kHz, 300 kHz, 130 kHz, and 20 kHz. The row 1 and 2 U-Bends were tested with a 0.580 inch Plus Point Probe utilizing frequencies of 400 kHz. 300 kHz, 150 kHz, and 20 kHz, with a pull speed of 0.1 inches per second and a rotation speed of 200 revolutions per minute (RPM). The hot-leg and cold-leg top-of-tubesheet roll transition regions were inspected using a 0.610 inch 3-coil Plus Point Probe. The 3-coil rotating Plus Point Probe consisted of the Plus Point Coil, a 0.080 inch Pancake Coil, and a 0.115 inch Pancake Coil. Test frequencies of 300 kHz, 200 kHz, 100 kHz and 20 kHz were used, with a pull speed of 0.5 inches per second and a rotation speed of 950 RPM. Laser Welded Sleeves were inspected using a 0.500 inch Plus Point Probe. Test frequencies of 300 kHz, 150 kHz, 150 kHz, 75 kHz, and 50 kHz, with a pull speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 0.2 inches per second and a rotation speed of 300 RPM were used. Special interest areas such as the "Locked Tube" support plate expansion areas were inspected using a 0.520 inch Gimballed Plus Point Probe.

#### 4.0 INSPECTION RESULTS

The primary and secondary analyses were performed on all of the eddy current data by Westinghouse. Attachment 3 contains the results of the eddy current inspection. Attachment 1 provides a summary of the reasons that the 202 tubes were plugged and the 269 tubes were sleeved. Attachment 4 contains the eddy current data for the tubes that were plugged/sleeved. All tubes were plugged with Inconel Alloy 690 Mechanical Tube Plugs. Attachment 2 contains a user's guide of the abbreviations used in the eddy current reports. All circumferential top-of-tubesheet indications that were removed from service by tube plugging were stabilized prior to plugging.

#### 5.0 CERTIFICATIONS

The examination procedures used during the eddy current inspection were approved by personnel qualified to Level III in accordance with the 1980 Edition of SNT-TC-1A. The procedures were approved in accordance with Westinghouse and ComEd procedures.

The personnel who performed the eddy current inspections were qualified to Level I and Level II in accordance with the 1980 Edition of SNT-TC-1A. Westinghouse Procedure QA 2.2 Rev. 5, and ComEd procedures. The Level I personnel performed inspections under the direct supervision of Level II personnel.

The personnel who performed the eddy current data analysis were qualified to a minimum of Level II, with special analysis training (IIA) in accordance with 1980 Edition of SNT-TC-1A. Westinghouse procedures, and ComEd procedures. Certification packages for examiners are available at Braidwood Station. Prior to performing data analysis ComEd requires each analyst to attend site specific training and testing.