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R. B. STARKEY, JR.
Vice President
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United States Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, DC 20555

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-324/LICENSE NO. DPR-62
NUREG-0619 FEEDWATER NOZZLE AND SPARGER EXAMINATION RESULTS

Gentlemen:

The purpose of this letter is to submit, pursuant to Nuclear Regulatory Commission NUREG-0619, subsection 4.4.3.1(2), the results of non-destructive examination of the feedwater nozzles and spargers for the Brunswick Steam Electric Plant, Unit 2. The results of these examinations, which were performed during the 1991 Reload 9 outage, are summarized in Enclosure 1. Enclosure 2 contains a General Electric evaluation performed for Carolina Power & Light Company of the circumferentially oriented flaws that were found in the sparger arm-to-tee circumferential welds.

As discussed in Enclosure 1, Carolina Power & Light Company plans to replace the feedwater spargers for the Brunswick Steam Electric Plant, Unit 2 during Refueling Outage Number 11 (Reload 11), currently scheduled to begin in September 1994. During the Reload 10 outage, CP&L intends to re-examine the feedwater spargers using an underwater high resolution remote operated camera. Due to the high dose rates in the deflooded reactor pressure vessel, CP&L does not intend to perform a liquid penetrant (LP) or ultrasonic (UT) examination of the feedwater spargers during the Reload 10 outage. Previous NRC correspondence (Reference 2 of Enclosure 1) has indicated that CP&L should continue to monitor the feedwater sparger crack growth at future outages by LP examination. Your concurrence with our proposed plan for using a remote camera examination, in lieu of liquid penetrant examination, for Cycle 11 operation with the existing feedwater spargers, is requested by September 1, 1992.

Please refer any questions regarding this submittal to Mr. W. R. Murray at (919) 546-4661.

Yours very truly,

R. B. Starkey, Jr.

WRM/wrm (b2r90619.wpf)

Enclosures

cc: Mr. S. D. Ebneter
Mr. R. H. Lo
Mr. R. L. Prevatte

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ENCLOSURE 1

BRUNSWICK STEAM ELECTRIC PLANT, UNITS 1 AND 2
NRC DOCKET NOS. 50-325 & 50-324
OPERATING LICENSE NOS. DPR-71 & DPR-62
NUREG-0619 FEEDWATER NOZZLE AND SPARGER EXAMINATION RESULTS

The following information is provided in accordance with NRC NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking," and pertains to the nondestructive examination (NDE) of feedwater nozzles and safe ends performed at the Brunswick Steam Electric Plant, Unit 2 during the Fall 1991 refueling outage.

I. STARTUP/SHUTDOWN CYCLES EXPERIENCED:

When the Brunswick Steam Electric Plant, Unit 2 was shutdown in September 1991 for maintenance and Refueling Outage Number 9, 158 startup/shutdown cycles had been experienced. This quantity included three (3) startup/shutdown cycles since the previous inspection.

II. SCOPE OF EXAMINATIONS AND SEQUENCE:

The total scope of the liquid penetrant (LP) examination was 55 sparger flow holes, twelve circumferential sparger tee welds (4 branch connections and 8 run connections), and 4 nozzle blend radius regions.

The four nozzle blend radius regions were ultrasonically (UT) examined along with five (5) sparger arm-to-tee circumferential welds.

The feedwater nozzle blend radius regions were first ultrasonically examined from the outside of the nozzle. Following draining of the reactor vessel, the inner surfaces of the nozzle blend radius regions were liquid penetrant examined. The feedwater spargers were first visually examined (VT-3), looking for gross defects or missing pieces prior to liquid penetrant examination of fifty-five flow holes and the twelve circumferential welds associated with the feedwater spargers, (i.e., eight welds connecting the tee-to-sparger arms and the four welds connecting the thermal sleeve to the tee). Based upon the feedwater sparger LP examination results, five (5) of the sparger arm-to-tee circumferential welds which exhibited circumferentially oriented indications were UT examined to determine the extent of the cracking.

III. DESCRIPTION OF EXAMINATION TECHNIQUES:

The non-destructive examination (NDE) methods employed for the external examination of the feedwater nozzle blend radius regions was manual ultrasonic examination. The ultrasonic examinations were performed from the nozzle outside diameter using special contoured transducer wedges designed specifically for zone 1, 2, and 3, at the Brunswick Steam Electric Plant (see attached excerpt from the General Electric Company procedure GER-UT-303). The ultrasonic examination employed angle beam shear wave techniques as recommended by General Electric Company. The inner surface of the nozzle blend radius regions was liquid penetrant examined along with the sparger flow holes and circumferential welds. As previously discussed, a video was made of the results of the LP examination and a review of this video determined that five of the circumferential welds should be ultrasonically examined. The selected feedwater sparger

circumferential welds were manually ultrasonically examined using 45° angle shear wave transducers to determine the length of the outside diameter indications.

IV. NONDESTRUCTIVE EXAMINATIONS RESULTS:

No relevant indications were found on the nozzle blend radius regions using ultrasonic and liquid penetrant examinations.

The feedwater sparger flow holes continue to show slow crack growth. No significant new flow hole crack growth was found, and no pieces of the spargers have separated from around the flow holes. No relevant LP indications were found on the outside diameter surface of the circumferential welds connecting the tee to the thermal sleeve. Five of the eight sparger arm-to-tee circumferential welds had circumferentially oriented liquid penetrant indications on the outside diameter surface, the longest of which was two inches long on the right side of the 135° azimuth sparger tee. It was assumed that these outside diameter LP indications represented through wall cracks; therefore these five welds were subsequently ultrasonically examined for the full 360° circumference to determine the length of the indications on the inside diameter surface. Due to the weld contour and close proximity to the flow holes, only two of the cracks could have the inside diameter length sized; however, it was verified that no crack on any sparger examined extends beyond the liquid penetrant indications on the outside surface. The longest crack found on the inside diameter surface was 1.875 inches on the right side of the 135° azimuth tee. The conclusion of the liquid penetrant and ultrasonic examinations is that all of the circumferentially oriented cracks are through-wall, the cracks appear to have initiated from adjacent flow hole cracks, and the cracks now appear to be following the heat affected zone of the sparger tee-to-arm circumferential welds. All of the circumferential cracks are on the side of the sparger arm where the flow holes are located and are growing downward. Although new circumferentially oriented flaws were found, the circumferential indication on the outside diameter of the right side of the 135° tee was noted during the last examination, and no significant change was observed during the operating cycle (Cycle 9) following Reload Number 8.

V. SYSTEM MODIFICATIONS AFFECTING FEEDWATER FLOW AND/OR TEMPERATURE:

There have been no system modifications performed since the last refuel outage which would affect the feedwater flow or temperature.

VI. ON-LINE LEAKAGE MONITORING:

No on-line leakage monitoring system for the detection of feedwater bypass leakage past the thermal sleeve connections has been installed for the Brunswick Plant, Unit 2.

VII. SAFETY EVALUATION SUMMARY:

The feedwater spargers are not safety-related equipment. Failure of a circumferential weld would not affect the safe shutdown capability of the Brunswick Steam Electric Plant, Unit 2. Enclosure 2 determined the critical flaw size for joint failure (13.57 inches) and the maximum permissible length of a "beginning of fuel cycle flaw" to be 10.9 inches. The longest documented existing circumferentially oriented flaw is 2 inches long on the right side of the 135° azimuth sparger tee. Therefore, Carolina Power and Light Company believes that the continued operation of the Brunswick Plant, Unit 2 until

the next refueling outage, currently scheduled to begin March 1993, is [illegible] and will not adversely affect the health and safety of the public. The evaluation [illegible]ing the flow hole cracking and small loose parts, General Electric Company Evaluation No. RDE-42-1289, Rev. 1, "BSEP Unit II Feedwater Sparger Crack Growth Assessment," Feb. 1990, previously transmitted to the NRC as part of Reference 1 is still valid.

VIII. FUTURE PLANS FOR THE BNP UNIT 2 FEEDWATER SPARGERS.

Carolina Power & Light Company plans to replace the feedwater spargers for the Brunswick Steam Electric Plant, Unit 2 during the Refueling Outage Number 11 (Reload 11), currently scheduled to begin in September 1994.

Previous correspondence (Reference 2) with the NRC has resulted in the directive that CP&L should continue to monitor the sparger crack growth at future outages by liquid penetrant examination. The performance of ultrasonic or liquid penetrant testing requires that the reactor vessel be deflooded.

Due to the high dose rates in the deflooded reactor pressure vessel (approximately 1 millirem per second, with the shielded work platform in position), CP&L does not intend to perform a liquid penetrant or ultrasonic examination during Refueling Outage Number 10. Instead, CP&L proposes to re-examine the feedwater spargers using an underwater, high resolution, remote operated camera. The remote camera examination is expected to save approximately 9 person-rem.

The Company believes that the extensive non-destructive examination performed during the Reload 9 outage provides a solid data base on the feedwater spargers that will allow use of a camera examination during Refueling Outage Number 10. The examination inspection data obtained during Refueling Outage Number 9 will be used to determine those areas on which to concentrate the camera inspection. Thus, a thorough examination (and subsequent repairs, if required) can be performed without deflooding the reactor pressure vessel.

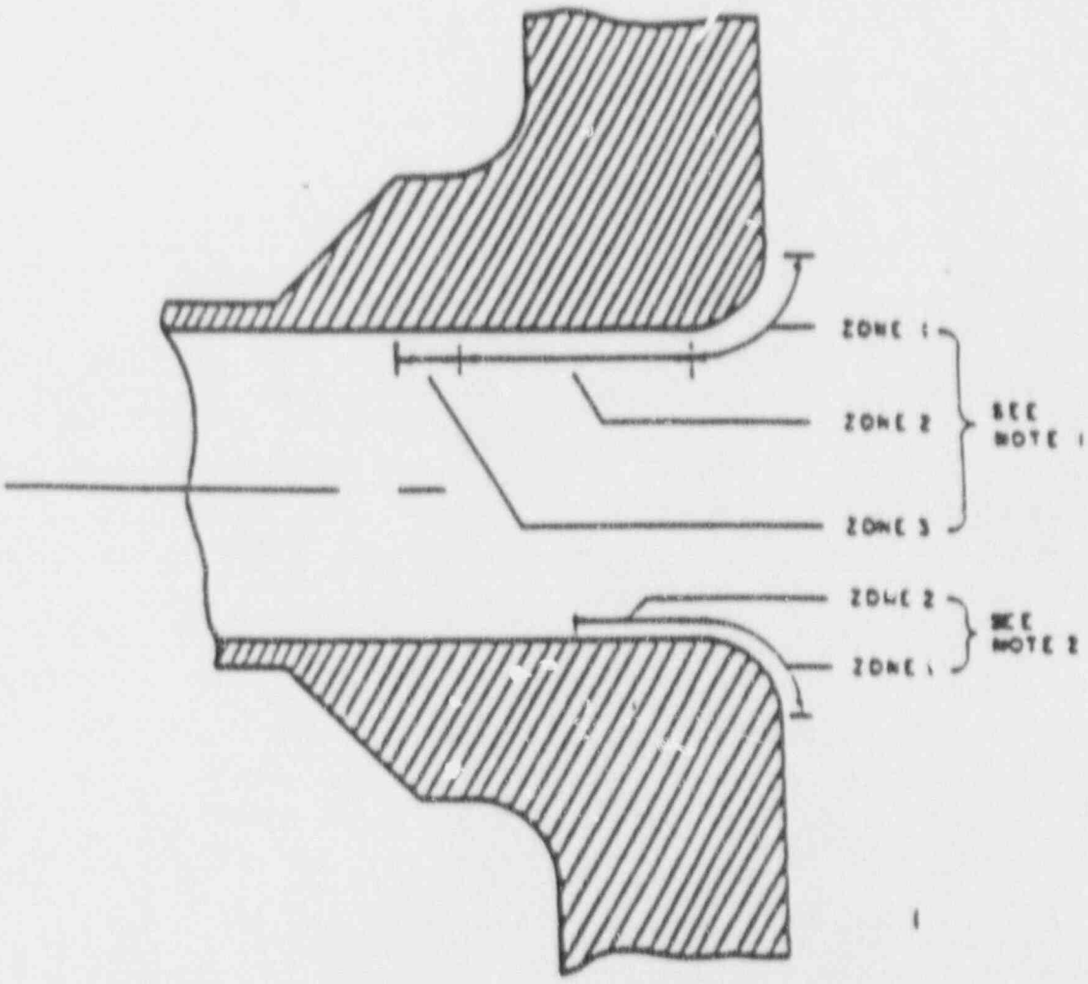
If any sparger pieces appear likely to become loose parts prior to replacement of the sparger during the Reload 11 outage, a contingency repair will be implemented. This contingency repair may consist of using divers to remove the piece(s) or to capture the potential loose piece(s) in place using underwater welding.

Based on the information described above, Carolina Power & Light Company requests that the NRC Staff provide concurrence with the Company's proposed plan for using a remote camera examination, in lieu of liquid penetrant examination, for the final cycle of operation with the original spargers (Cycle 11). In order to support planning activities for the Brunswick Plant, Unit 2 Reload 10 outage, CP&L requests NRC Staff concurrence be provided by September 1, 1992.

REFERENCES:

1. Letter from L. I. Loflin (CP&L) to Document Control Desk (USNRC) dated September 14, 1990 (Serial No. NLS-90-183), "Performance of Nondestructive Examination of Feedwater Nozzles and Safe Ends During The 1989/1990 Maintenance/Refueling Outage."

2. Letter from Mr. N. B. Le (USNRC) to Mr. L. W. Eury (CP&L) dated June 6, 1991, "Review of the Carolina Power & Light Company's Report on Performance of Nondestructive Examination of Feedwater Nozzles and Safe Ends During the 1989/1990 Maintenance/Refueling Outage at Brunswick Steam Electric Plant, Unit 2 (TAC No. 77745)."



NOZZLE EXAMINATION ZONES

NOTES

1 FEEDWATER NOZZLES REQUIRE ZONES 1,2,3 PER NUREG 0619

2 ALL BWR NOZZLES EXCEPT FEEDWATER REQUIRE ONLY ZONES 1 & 2

FIGURE 1