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Docket No: 50-369

Mr. H. B. Tucker, Vice President
 Nuclear Production Department
 Duke Power Company
 P.O. Box 33189
 422 South Church Street
 Charlotte, North Carolina 28242

Dear Mr. Tucker:

Subject: Operation of Unit 1 at 75% Power (McGuire Nuclear Station)

By letter dated July 19, 1982, we informed you that your McGuire Unit 1 operating program was acceptable for interim operation at 50 percent power until completion of the staff's evaluation of your final steam generator eddy current test (ECT) report which was filed with your letter dated August 3, 1982. On the basis of your evaluation you propose to operate Unit 1 until the next planned shutdown (November, 1982) or until implementation of the steam generator modification. Unit 1 would be operated at a power level no greater than 75 percent, however, the operating time above 50 percent would be restricted to 30 days during this period of operation.

As a result of our review of the information provided as well as discussions with your staff, we conclude and find acceptable your McGuire Unit 1 operating program for a period extending from July to November, 1982, including operation at 75 percent power for a maximum of 720 hours (30 days).

We require that the staff be immediately notified in the event there is any indication of steam generator behavior contrary to the information which was provided in your August 3, 1982 letter. A summary of the results of our review is presented in the enclosure.

Sincerely,

Thomas M. Novak, Assistant Director
 for Licensing
 Division of Licensing

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Enclosure:
 As stated

cc: See next page

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McGuire

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REVIEW OF McGUIRE UNIT 1 EDDY
CURRENT RESULTS OF OPERATION AT 75% POWER
AND PROPOSED OPERATING PROGRAM EXTENDING
TO NOVEMBER 1982

REF: DUKE POWER COMPANY LETTER
REPORT DATED AUGUST 3, 1982

INTRODUCTION

By letter dated August 3, 1982, Duke Power Company submitted results of the June/July 1982 eddy current inspection (ECT) of their steam generators, and based on these results proposes an operational plan for McGuire Unit 1 until the next planned shutdown, tentatively scheduled for November 1982, or until implementation of the steam generator modifications. The licensee proposes to operate McGuire Unit 1 during this period at a power level no greater than 75 percent. The operating time above 50 percent power will be restricted to 720 hours during this period of operation.

The licensee's technical justification for operation of McGuire 1 for a limited time at 75% includes the eddy current results which established wear rates at 75% power, and a conservative upper bound of the amount of additional tube wear, which when applied to the largest existing tube defect during the next period of operation at 75% power, will not exceed the 40% plugging limit for that tube.

DISCUSSION

McGuire 1 had accumulated the following operating history at the time it was shut down on February 26, 1982:

<u>Power Level</u>	<u>Hours at or above this power level</u>
50%	1500
75%	324
90%	72
100%	23

The total number of effective full power hours at that time was 1093.

On March 14, 1982 McGuire 1 recommenced operation initially at 50% power for 1500 hours and then at 75% power for 720 hours until its shut down for inspection on June 23, 1982. Eddy current testing during the March 1982 outage revealed four tubes with O.D. indications in steam generator C. These indications have been attributed to small volume wear defects which the licensee estimated to have a conservative upper bound of 4.0×10^{-4} cubic inches for the volume of the largest defect. Eddy current analyses indicated that the wall penetrations were < 20% for these defects.

In his submittal on April 28, 1982 to justify operation for 720 hours at 75% power, the licensee estimated that tube wear due to fretting during this period would be equivalent to a volume of 8.89×10^{-4} cubic inches. Based on this incremental tube wear, the four worst tubes in steam generator "C" would have an estimated defect volume of 1.29×10^{-3} cubic inches which is equivalent to a depth of less than 10 mils (23% penetration).

The recent eddy current inspection was completed in early July following 720 hours of operation at 75% power, making total operation of McGuire 1 at 75% power and higher in excess of 1000 hours.

There are 688 steam generator tubes in the first three rows of the preheater section in the McGuire Unit 1 steam generators, and wear indications, using absolute techniques were found on 29 of these tubes, or about 4 percent. Significant wear (through wall penetration greater than 20 percent) was not found on any tubes. Only four tubes exhibited wear penetrations greater than 12 percent through wall (approximately 5 mils) and one tube had 20% through wall penetration.

During the July ECT inspection, several sophisticated eddy current techniques were used, including absolute and pancake coil techniques. For the four larger defects (greater than 12 percent) the pancake coil readings were lower than those obtained by absolute and differential methods. Measurement of circumferential extent of defects, even the largest one, showed that defects extended 90° or less around the tube. Based on data from tubes removed from European units (Ringhals 3 and Almaraz 1), these defects with limited circumferential extents are very small; therefore, it is concluded that the ECT measurements are conservative.

The results of the eddy current inspection provided an upper bound for the wear for the steam generator tubes in McGuire. This wear rate which applies to only one tube (tube 49-40 in steam generator C) is

$$2 \times 10^{-3} \text{ in}^3 \text{ for 30 days at 75\% power}$$

The conservative upper bound for this defect volume is $3 \times 10^{-3} \text{ in}^3$. An additional 30 days at 75 percent power would therefore increase

the volume of this defect to 5×10^{-3} in³, which represents a through wall penetration of 40 percent using data from tubes pulled at Almaraz 1 and Ringhals 3. This single tube is therefore likely to be a pluggable indication at the next inspection.

For all other steam generator tubes, wear rates at 75 percent power are much lower than that calculated above. Typical bounding values are 0.5×10^{-3} in³ per 30 days of operation at 75 percent power. This corresponds to additional through wall penetration of 2 mils or about 5 percent. Actual wear rates range down to 0 percent.

Evaluation and Conclusions

We find that McGuire Unit 1 may be operated at power levels above 50 percent but no greater than 75 percent power for 720 hours until the next planned shutdown, tentatively scheduled for November 1982 or until implementation of the steam generator modifications, without undue risk to public health and safety. This finding is based upon the following:

- (1) Up through June 23, 1982, McGuire Unit 1 had operated approximately 1044 hours at and above 75% with ECT indications detected on 29 of the 688 tubes in the first three rows of the preheaters in the steam generators.
- (2) Four tubes had defect indications greater than 12% with only one tube with a 20% through wall defect. Wear rate for all but the 20% defect had a bounding value of 0.5×10^{-3} cubic inches per 30 days of operation at 75% power. This corresponds to an additional through wall penetration of 2 mils or about 5% for this past period of operation. This value would be a conservative estimate of additional penetration of the tubes in the preheater section for the proposed period of operation of 720 hours at 75% power, and few tubes are expected to exceed 20% through wall penetration at the next inspection.

- (3) Tube 49-40 in steam generator C exhibited a through wall defect of 20% which conservatively corresponds to a wear volume of 2.0×10^{-3} cubic inches. For predicting additional wear on this tube, a conservative upper bound of 3.0×10^{-3} cubic inches for 720 hours at 75% power is assumed.
- (4) Using an upper bound of 2.0×10^{-3} cubic inches as the existing wear volume on tube 49-40 and adding a conservative upper bound wear volume of 3.0×10^{-3} cubic inches for 720 hours at 75% power, the volume of the defect in tube 49-40 will not exceed 5.0×10^{-3} cubic inches at the end of the proposed period of operation. This corresponds to a through-wall penetration of about 40%, which is the plugging limit for McGuire Unit 1 steam generator tubes. Therefore this tube would be subject to plugging.
- (5) Restrictive limits on allowable primary to secondary leakage in the Technical Specifications provide adequate assurance of tube integrity.

We request that the NRC staff be immediately notified in the event that further evaluation of the data presented indicates that steam generator tube behavior is contrary to the information which was provided in the August 3, 1982 submittal.