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DUKE POWER

March 25, 1993

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D. C. 20555

Subject: Catawba Nuclear Station, Unit 1
Docket No. 50-413
Additional Information Supporting Catawba Unit 1 Operation for the Remainder of Cycle 7

On September 17 and 23, 199. Catawba Nuclear Station submitted supplements to a proposed Technical Specification Amendment which revised the steam generator repair criteria for Catawba Unit 1 Cycle 7 operation. In these letters, Catawba committed to supplying additional analyses and data during the first quarter of 1993 to further support the Interim Plugging Criteria (IPC) which was subsequently granted by the NRC on September 25, 1992. Attached is the additional technical information committed to in the above mentioned letters. This information continues to support the operation of Catawba Unit 1 for the remainder of Cycle 7.

Enclosed is WCAP-13494, Rev. 1. This WCAP contains information which is proprietary to Westinghouse and the Electric Power Research Institute (EPRI). An additional designation (g) has been included in the Westinghouse WCAP reports to identify information owned by EPRI. Please refer to the separate attached affidavit furnished by EPRI for the bases for requesting that the information in WCAP-13494, Revision 1 marked with the (g) designation be withheld from public disclosure. The necessary proprietary affidavit for Westinghouse WCAP-13494, Rev. 1 is provided along with the non-proprietary version of WCAP-13494, Rev. 1 (WCAP-13495, Rev. 1).

Enclosed are:

1. 2 copies of WCAP-13494, Rev. 1, "Catawba Unit 1 Technical Support for SG Interim Plugging Criteria for Indications at Tube Support Plates" (Proprietary)

2. 2 copies of WCAP-13495, Rev. 1, "Catawba Unit 1 Technical Support for SG Interim Plugging Criteria for Indications at Tube Support Plates" (Non-Proprietary)

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Also enclosed is the Westinghouse authorization letter, CAW-93-429, the accompanying affidavit for CAW-93-429, a Proprietary Information Notice, and a Copyright Notice.

As item 1 contains proprietary information to Westinghouse Electric Corporation, it is supported by affidavits signed by Westinghouse, the owner of the information. The affidavit sets forth the basis on which the information will be withheld from public disclosure by the Commission and addresses with specificity the considerations listed in paragraph (b)(4) of 10 CFR Section 2.790 of the Commission's regulations.

Accordingly, it is respectfully requested that the information which is proprietary to Westinghouse be withheld from public disclosure in accordance with 10 CFR Section 2.790 of the Commission's regulations.

Correspondence with respect to the copyright or proprietary aspects of the item listed above or the supporting Westinghouse Affidavit should reference CAW-93-429 and should be addressed to Nicholas J. Liparulo, Manager of Nuclear Safety and Regulatory Activities, Westinghouse Electric Corporation, P.O. Box 355, Pittsburgh, Pennsylvania 15230-0355.

In addition, enclosed is an executive summary of the information contained in WCAP-13494, Rev. 1. Catawba also plans to submit information on the probabilistic risk perspectives of the interim plugging criteria as applied to Catawba. This information will be submitted within the next few days so that it can be reviewed prior to the Duke/NRC meeting on April 1, 1993.

On September 25, 1992, The Nuclear Regulatory Commission issued Amendment 102 to Facility Operating License NPF-35 and the associated safety evaluation which permitted the implementation of an interim steam generator plugging criteria for the tube support elevations. This change was only applicable for Unit 1 Cycle 7. The safety evaluation concluded that a mid-cycle inspection of the Unit 1 S/Gs is necessary by May 1, 1993 to ensure that the 1 volt interim limit provides a comparable level of conservatism as compared to the interim limits approved for plants with 7/8-inch outside diameter (OD) S/G tubing. Duke Power believes that the previous submittals and the information provided with this letter supports full cycle operation of Catawba Unit 1 during Cycle 7. Therefore, Duke Power respectfully requests that the NRC delete the requirement for a mid-cycle outage contained in the safety evaluation and allow full cycle operation for Catawba Unit 1 during Cycle 7. Duke Power requests notification of the NRC's decision in this matter by April 15, 1993.

I declare under penalty of perjury that these statements are true and correct to the best of my knowledge.

Very truly yours,

M. S. Tuckman

M. S. Tuckman

RKS

Enclosures

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EXECUTIVE SUMMARY

Follow-Up To The Catawba Nuclear Station
IPC Amendment For Unit 1 Cycle 7

WCAP-13494, Revision 1

Introduction

Several issues were identified by the NRC staff in the Safety Evaluation which permitted the implementation of the steam generator tube interim plugging criteria (IPC) for TSP elevation ODSCC at Catawba Unit 1 which led them to conclude that a mid-cycle outage is necessary by May 1, 1993. All of the issues are directly related to demonstrating that adequate burst pressure margin exists during Cycle 7 operation upon implementation of the steam generator tube IPC. All issues are related to differences in the burst pressure/bobbin voltage correlations developed for 7/8-inch and 3/4-inch tubing. The issues can be summarized as follows:

1. The end of cycle (EOC) burst pressure margin to the structural limit is reduced for 3/4-inch steam generator tubing in contrast to 7/8-inch tubing.

2. The voltage measurement uncertainties are larger at Catawba Unit 1 than was the case for previous IPC/APC submittals for 7/8-inch tubing.

3. Bounding values of voltage growth at Catawba Unit 1 exceed the allowable EOC voltage; this did not occur in plants with steam generators with 7/8-inch tubing due to the existence of additional EOC burst margin.

4. Confirmation of a level of conservatism consistent with that which is inherent in IPCs that have been approved for other plants is required.

Duke Power Company believes that the information submitted previously and supplemented by this letter adequately addresses items 1) through 4) above and supports the operation of Catawba Unit 1 for the remainder of Cycle 7. The following information has been added to enhance the burst pressure/SLB leakage correlation. The pulled tube database has been updated to include the 1992 Catawba Unit 1 pulled tubes and final data for the Belgian pulled tubes. In addition, analysis for tube support plate (TSP) displacement in a steam line break (SLB) event has been performed. Collectively, the results of these analyses show that steam generator tube integrity and tube bundle leaktightness are expected to be maintained within acceptable limits during all plant conditions for the remainder of Cycle 7 (and beyond) with implementation of the IPC.

Discussion

The vertical tube support plate displacements for the Model D3 steam generators during a postulated steam line break event (which would result in exposing the cracking occurring within the TSP intersections) have been evaluated and have been shown to be limited. The analyses

include thermal hydraulic evaluations to develop the loads on the tube support plates and dynamic non-linear finite element analyses to determine tube support plate displacements. The principal conservatisms in the analysis include the SLB occurring during hot standby conditions to maximize pressure loads on the TSPs and zero friction with as-manufactured tube to TSP gaps to maximize tube support plate displacements.

Regardless of the eddy current measurement uncertainty or growth rate used in the development of the IPC for Catawba Unit 1, based on the limited displacement under steam line break conditions, the estimated steam generator tube burst probability ($< 8.2 \times 10^{-4}$ per steam generator) is negligibly small even under the extremely conservative assumption that all TSP intersections have through-wall indication. This tube burst probability is significantly less than the guideline value of 2.5×10^{-2} stated in NUREG-0844. Deterministically, the maximum deflection of the TSPs at any location is less than the critical crack length that would be expected to burst during a postulated SLB event. Therefore, it can be concluded that tube burst considerations should not be used as the basis for establishing the Catawba Unit 1 tube repair limit nor should it be used to determine the need for a mid-cycle shutdown. Satisfaction of allowable SLB leakage limits should be the limiting factor.

However, free span burst margins were included in WCAP-13494, Rev. 0 and comparative assessments are included in Revision 1. At +90% cumulative probability on allowances for growth and NDE uncertainties, the projected EOC volts are 1.71 volts for the limiting steam generator C bobbin indication. The EOC burst pressure margin ratio for burst capability to 3 times normal operating pressure differential is 1.29, a substantial margin in excess of the RG 1.121 criterion. The EOC burst pressure ratio for a typical case for the 1.0 volt IPC applied to 7/8 inch diameter tubing is calculated to be 1.20 which is slightly less than the tube burst pressure ratio calculated for the 3/4 inch tubing. (Note: Margins to burst and 3 times normal operating pressure differential are a function of individual plant normal operating steam generator pressure and vary from plant to plant event for the same tube size).

A repair limit for TSP elevation ODSCC of approximately 1.0 volt is projected to result in maximum EOC voltages comparable to that found following the implementation of a 40% depth limit (i.e., 3 to 4 volts). Thus, the IPC does not increase the limiting indication for tube integrity compared to the previous 40% depth plugging limit for the TSP intersections. The only consequence of the implementation of the IPC is a larger number of small indications are left in service which are shown to have negligible leakage potential during all plant conditions (both deterministic and Monte Carlo analyses show that SLB leak rates at EOC7 are negligible (<0.1 gpm) compared to the 1.0 gpm allowable leak rate during postulated steam line break conditions).

Finally, consistent with a defense-in-depth philosophy, the operating leak rate limit of 150 gpd implemented with the IPC provides further assurance for plant shutdown prior to reaching the critical crack lengths for SLB conditions at leak rates less than a -95% confidence level and for 3 times the normal operating pressure differential at less then nominal rates.

Conclusion

In light of the above, Duke Power Company concludes that the mid-cycle shutdown of Catawba Unit 1 is not warranted. The steam generator tube IPC as implemented in September of 1992 including the tube repair bases, the eddy current inspection requirements, and operating leakage limit is in compliance with all applicable regulatory acceptance criteria (e.g., RG 1.121, RG 1.83). Even under the assumption of free span indication, the 1.0 volt IPC repair limit for the 3/4-inch tubing provides EOC margin against burst in excess of RG 1.121 recommended acceptance criteria. It also provides a comparable level of conservatism to the interim plugging limits approved for plants with 7/8-inch diameter steam generator tubing. SLB leak rates at EOC are negligible with <0.1 gpm expected compared to the allowable 1.0 gpm leak rate during a postulated steam line break condition. And the operating leak rate limit of 150 gpd adequately addresses RG 1.121 guidelines for leak before break.