Docket

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555

April 13, 1992

Docket Nos. 50-348
and 50-364

LICENSEE: Southern Nuclear Operating Company, Inc.

FACILITY: Joseph M. Farley Nuclear Plant, Units 1 and 2

SUBJECT: MEETING SUMMARY OF JANUARY 16, 1992

A meeting was held with Southern Nuclear Operating Company, Inc. (Southern Nuclear), on January 16, 1992, in Rockville, Maryland. The purpose of the meeting was to discuss Southern Nuclear's request to amend the Joseph M. Farley Nuclear Plant, Units 1 and 2 (Farley), Technical Specification requirements for steam generator tube repair. The request for alternate plugging criteria (APC) was submitted by Southern Nuclear in a letter dated February 26, 1991, and was supplemented by letter dated November 6, 1991.

The status of NRC and Southern Nuclear activities associated with the review of the amendments request was discussed, as well as general plans for the meeting scheduled for February 6, 1992, on the same subject. Attendees were as follow:

NRC	Southern Nuclear
E. Murphy	B. Moore
S. Hoffman	R. Mullins

Results from recent Trojan Nuclear Plant (Trojan) steam generator tube inspections were discussed. The need to evaluate this information for its potential effect on the Farley submittal was identified. It was agreed that Southern Nuclear would evaluate the Trojan data and consider a revision to their submittal to address the data, as well as other issues that have been identified during the ongoing review.

Additional issues associated with APC (such as radiological analyses and the potential for steam generator tube collapse under combined loss-of-coolant accident and safe shutdown earthquake loads) still need to be discussed in more detail in the future. Enclosure 1 was provided by Southern Nuclear summarizing radiological analyses.

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Southern Nuclear was provided with an advance set of questions concerning the APC submittals (Enclosure 2). In addition, an advance copy of questions concerning Southern Nuclear's February 26, 1991, submittal amending the Farley fire protection Technical Specifications was also provided to them at the meeting (Enclosure 3). Both sets of questions will be formally transmitted by letter in the future.

Original signed by

Stephen T. Hoffman, Project Director
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Enclosures:
As stated

cc: See next page

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Joseph M. Farley Nuclear Plant

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Enclosure 1

Radiological Consequences

	Current	With A[illegible]C
Normal Operation		
Allowed Leakage	0.35 gpm per SG	0.1 gpm per SG
Reference		
Dose	Condition I events do not result in any protection system activation and present no radiological hazard. Radiological hazards for Condition II events shall remain within the guidelines of 10CFR20.	
Reference		
Regulatory Limit		
FNP Licensing Basis Reference	TS 3.4.7.2 Operational Leakage LCO	TS 3.4.7.2 Operational Leakage LCO
SLB Accident		
Assumed ~~XXXXXXX~~ Leakage	0.35 gpm per SG 1.0 gpm total all SGs	0.1 gpm per intact SG 55 gpm for faulted SG
Reference TS 3/4.4.7.2 and FSAR Section 15.4.1		
Dose	*.8 rem @ site boundary .4 rem @ LPZ - for 1.0 gpm leakage	*30 rem @ site boundary
Reference *FSAR Figure 15.4-22 Thyroid Dose		
Regulatory Limit- TS 3/4.4.7.2 Bases	*small fraction 10CFR100 limit <30 rem	*small fraction 10CFR100limit <30 rem
FNP Licensing Basis Reference - TS 3/4.4.7.2 Bases	*<30 rem	*<30 rem

*FSAR 15.4.2.1.4 - well within the limits as defined in 10CFR100

QUESTIONS AND COMMENTS

on

J. M. Farley Units 1 and 2
SG Tube Plugging Criteria for
ODSCC at Tube Support Plates

WCAP-12871
Revision 1
SG-91-10-004

and

Additional Information Supporting
SG Tube Support Plate Plugging Criteria
for J. M. Farley Units 1 and 2

WCAP-13103
SG-91-10-040

Introduction

Further review and evaluation of Alabama Power Company's proposed alternate plugging criteria (APC) for the TSP region of Farley 1 and 2 steam generators was performed. The documents cited above were the main items reviewed. In addition, a meeting to discuss these documents was held in Bethesda, Maryland on November 20 with personnel from Westinghouse, Alabama Power Company, Pacific Northwest Laboratory, Oak Ridge National Laboratory, and the NRC.

Many of the questions and comments raised in an earlier Request for Additional Information were answered in one or both of the above documents. The APC has been significantly revised from the initial proposal. Under the revised APC, tubes with bobbin coil indications exceeding 4.0 volts due to ODSCC at TSPs will be plugged or repaired. All other portions of the tube would be governed by the 40% plugging criterion. In addition, tubes with RPC indications not attributable to ODSCC and all circumferential indications will also be evaluated for plugging or repair using the 40% criterion. Inspection requirements for implementation of the APC involve a 100% bobbin coil inspection of all hot leg TSP intersections and all cold leg intersections down to the lowest cold leg TSP with ODSCC indications. Further, all tubes with bobbin coil indications greater than 1.5 volts will be inspected using RPC probes. The RPC results will be evaluated to determine if ODSCC is the main cause of the signal. Indications confirmed to be ODSCC will be reinspected at alternate refueling outages for reconfirmation as ODSCC. The last major feature of the APC involves a decrease in the operating leakage limit. Plant shutdown will be implemented if normal operating leakage exceeds 150 gpd per steam generator.

Based on our review of the above documents and the November 20 meeting the following represents a compilation of our remaining questions, concerns and recommendations.

Questions, Concerns, and Recommendations

1) Trojan Data

Considering the significant quantity of pulled tube information recently generated from the Trojan Nuclear Plant we believe that WCAP-12871, Rev. 1 should be revised to incorporate these data. In other words, do the most recent results from Trojan supplement and support the APC for Farley?

2) IGA

Additional data was furnished on the problem of IGA at St. Lucie and Trojan. The IGA at these two plants was detected with the differential bobbin probe. The signals were above the level that would require plugging and the RPC inspection. The IGA present at Farley was discussed in more detail. It was stated that the IGA was only a few grains wide. Data from both an active tube and a plugged tube were presented. The plugged tube had about twice the IGA thickness as the active tube. Our main concern is that IGA may be present in Farley 1. Only one tube has been pulled, and this does not establish that IGA will not be present in the generators of this unit. Dan Dobbeni of Laborelec stated that volumetric IGA in a confined region, with a depth of over 60%, may not be detectable with eddy currents. Of four tubes that were pulled (three active, one plugged in 1990) from Doel 4 in 1991, all TSPs had volumetric IGA, with some additional axial IGSCC. The total depth was up to 100% and all contained within the TSP boundaries.

It is recommended that additional tubes from Farley 1 be pulled. These tubes would show if any IGA or circumferential cracking is present in this unit. Burst tests would also show if these defects obey the burst pressure - bobbin coil voltage correlation. Tubes selected for pulling should be those which include a "property variation" (mentioned as a precursor to circumferential cracking by Dan Malinowski).

3) Denting

A dent will distort the eddy current signal. While it can be demonstrated that some defect signals will be visible even when a large dent signal is present, this does not mean that they will always be visible. If the dent signals are on the edge of the TSP and the defect is in the center of the support, then they can be well separated. However, this may not always occur. A distorted dent signal will give some indication that a defect is present, but other signals in this region such as deposits, TSP distortions, and property changes of the Inconel tube, can also confuse the signals. It was stated that in field applications, small to moderate indications typically cannot be separated from dent signals, and that detection of cracks at dented intersections is unreliable when the degradation amplitude is smaller than the dent amplitude. In addition, the stress fields that dents create can lead to initiation of circumferential SCC such as was observed at North Anna.

Given these considerations we believe it is prudent to place a limit on the amount of denting allowed before requiring an RPC inspection. The amount of denting that could cause a 1.5 volt signal to be lost or misread should be estimated. For TSPs with denting voltages exceeding an allowable threshold an RPC inspection should be required, or the APC would not apply.

4) Human factors

The example defect plots shown by Westinghouse were easy to read and there was not much question on where to place the dots on the defect scans in order to measure voltage. However, there will be many cases where this will not be nearly as clear as noise, denting, probe wobble, and deposits become more of a problem. It was stated that uncertainties associated with field crevice conditions and human factors are more significant at the low amplitudes near the detection thresholds than at the proposed plugging voltage. Ostensibly this is because of higher signal to noise ratios for voltages near the APC.

We believe that the analysis guidelines given in Appendix A should be more detailed in order to provide the data analyst with more comprehensive guidance on appropriate procedures to apply for dealing with distorted signals.

Further, what information is available on the variation in measured bobbin coil voltages for several analysts evaluating the same data?

5) Crack Growth Outside the TSP

The primary method for detection of cracking outside the TSP is inspection with a bobbin coil probe. At least two instances of cracking outside the TSP were noted in the report. It is recognized that ODSCC is largely driven by conditions within the TSP crevice, but it is clearly not impossible for cracking to occur outside the TSP. Given the uncertainties in the bobbin coil technique what is the detection and sizing accuracy of the method described in Appendix A for cracks extending beyond the TSP?

6) Probability of Tube Burst Under SLB

Table 12.3 presents an estimate of the probability of tube burst under SLB conditions for a single tube or degraded TSP intersection. Table 12.3 addresses tube burst probabilities at "maximum" uncertainty values for NDE and crack growth. Tube burst may be more likely at lower (but more probable) values of these uncertainties. The probability for tube burst under SLB should be treated in a manner similar to the SLB leakage model. A distribution of voltage indications (which will tend to shift to higher voltages with time) should be combined using Monte Carlo techniques with the voltage growth rate distribution, the eddy current uncertainties distribution and the burst pressure versus voltage correlation to obtain a projected cumulative EOC SLB probability of tube burst. Therefore, it should be demonstrated that the cumulative probability of tube burst for the entire steam generator under SLB is at or below the level given in NUREG-0844.

7) Bobbin Coil Voltage - Leak Rate Correlation

A continuing concern is that the bobbin voltage - leak rate correlation data base is very small. Almost all of the data was obtained from model boiler specimens and the data listed on page 9.6 suggests that these specimens may leak more than comparable pulled tube specimens. Of the two pulled tube specimens with voltages around 10 volts one did not leak at all, and the other leaked at a rate of only 0.11 lph. In contrast, the four model boiler specimens with voltages near 10 volts exhibited leak rates of 0.14, 2.4, 3.9, and 5.12 lph. In addition the one pulled tube sample with a voltage of 7.5 volts did not leak, but the model boiler specimens with voltages ranging from 6.5 to 8.4 volts leaked at rates ranging from 2.69 to 82.5 lph. These data underscore the variability in observed leak rates from SCC flaws due to the presence of small ligaments, irregular fracture faces, residual stresses, and corrosion product buildup within the crack. Thus, predictions of leakage based on the small data base may be significantly in error, and, as noted in the report, the lowering of operational leak limits may not ensure LBB.

8) Calibration and Probe Centering Uncertainty

Calibration correction factors and probe centering uncertainty are minimized by utilizing a four through-wall hole ASME standard. What effect does allowable variations in the fabrication of the four hole standards have on the magnitude of these uncertainties (i.e., at the minimum and maximum tolerances)?

9) Eddy Current Reliability

It was noted that a given voltage amplitude does not define a unique crack geometry. For a particular voltage a range of crack morphologies may occur involving different crack densities, lengths, depths, and ligaments between cracks. This range of crack geometries gives rise to the spread in the voltage - burst, the voltage - leak, and the voltage - growth correlations. In the case of the voltage - burst and voltage - leak correlations this spread is compensated for by selecting the 95% lower confidence band of the test data. Since the bobbin coil voltage does not give a specific crack morphology or size(s) it is not possible to evaluate crack(s) severity using fracture mechanics techniques. Thus, considerable reliance is placed on the various correlations compensating for a large number of uncertainties. A fundamental issue is the reliability of the bobbin coil inspection to detect and size (in terms of volts) "significant" flaws - namely those which lead to a high probability of tube failure under SLB. Therefore, what is the probability of detection of "significant" flaws?

10) Additional RPC Inspections

Due to the uncertainties in the bobbin coil inspection, it is recommended that a sampling inspection of about 100 tubes be performed with the RPC. This would improve the chances of showing any significant crack extension beyond the TSP or the existence of circumferential cracking. In addition, it may detect volumetric IGA that may produce signals under 1.5 volts.

11) Additional Tube Pulls

A general concern is the paucity of relevant pulled tube data available for the voltage - burst and voltage - leak correlations. This concern is especially acute for the voltage - leak correlation as noted in (7). Consequently, what are the licensee's plans to perform future tube pulls at both Units 1 and 2 to strengthen the data bases and validate the various correlations?

REQUEST FOR ADDITIONAL INFORMATION

JOSEPH M. FARLEY NUCLEAR PLANT - UNITS 1 AND 2

By letter dated February 26, 1991 the Licensee requested that fire protection requirements be removed from plant technical specifications and that a standard license condition replace the current fire protection license condition. This request was made in accordance with NRC Generic Letter 86-10, "Implementation of Fire Protection Requirements".

In order to ensure that existing fire protection requirements are not reduced, please provide those portions of the FSAR which are intended to replace current technical specification requirements. In addition, if new fire protection implementing procedures have been put in place to define surveillance requirements, compensatory measures and other fire protection requirements currently in the technical specifications, please include a copy of these in the response.

The staff is also concerned that all equipment required for safe shutdown during any given fire is covered by plant Technical Specifications as directed by Generic Letter 88-12. This concern is especially acute at two-unit sites where safe shutdown equipment in one unit is considered to be the alternative equipment for the other unit. In such a case, Technical Specifications are required on the equipment involved to assure that such equipment is maintained in service at all times, for instance during refueling or other maintenance outages of either unit. In addition to the SAIC question, the licensee should also identify the Technical Specifications provided for all equipment required for safe shutdown during fires and show how/where these requirements have been established and retained or provide a commitment to develop and implement Technical Specifications addressing safe shutdown equipment.