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 RECIP.NAME RECIPIENT AFFILIATION

DOCKET #  
05000287

SUBJECT: Updates RO-287/80-11 re cracked studs on once-through steam generator manway.B&W has completed examination of three cracked studs.Final results will be documented in rept for util by mid-Sept.

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NOTES:M Cunningham:all amends to FSAR & changes to Tech Specs. 05000287

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DUKE POWER COMPANY

POWER BUILDING

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WILLIAM O. PARKER, JR.  
VICE PRESIDENT  
STEAM PRODUCTION

September 8, 1980

TELEPHONE: AREA 704  
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Mr. James P. O'Reilly, Director  
U. S. Nuclear Regulatory Commission  
Region II  
101 Marietta Street, Suite 3100  
Atlanta, Georgia 30303

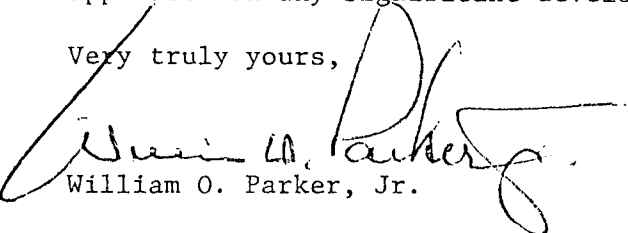
Re: Oconee Unit 3  
Docket No. 50-287

Dear Mr. O'Reilly:

Please find attached an update on the corrective actions being performed with respect to the cracked studs found on the Oconee Unit 3 OTSG primary manway. These corrective actions were identified by Reportable Occurrence Report RO-287/80-11, which was submitted to you in my letter of July 16, 1980.

Work is continuing in this area. We shall continue to keep your office apprised on any significant developments which occur.

Very truly yours,

  
William O. Parker, Jr.

FTP:scs  
Attachment

cc: Director  
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Washington, D. C. 20555

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DUKE POWER COMPANY  
OCONEE NUCLEAR STATION

Update on Corrective Actions Relating to  
Cracked Studs on Oconee Unit 3 OTSG Primary Manway

Reportable Occurrence Report RO-287/80-11 identified seven areas of corrective actions which were being pursued and evaluated by Duke Power Company to reduce the probability of stud failure during plant operation. These items and an update on the status of the work being performed on each are provided in the following pages.

Item 1

Further metallurgical examination of the Unit 3 cracked studs is being pursued to verify material properties and to further investigate the cause of the crack initiation.

Status

Babcock & Wilcox (B&W) has completed an examination of three of the cracked studs. A report documenting the final results of the examination is expected to be sent to Duke Power by mid-September. At that time, Duke will provide a supplemental report to the NRC discussing the results of the metallurgical examination.

Two additional studs have been provided to the NRC and are presently under examination at the Battelle Laboratory. The results of this independent examination will be used to verify the failure mechanism identified by the B&W examination.

Furthermore, B&W is examining two additional studs from Oconee. The failure location on these studs appears to be different from those previously examined. This examination will be used to verify the previously identified failure mechanism.

Item 2

Stud material documentation for Oconee Units 1, 2, and 3 will continue to be researched to explore the possibility of anomalies in the stud materials.

Status

QA data packages for all SA-320 L43 studs shipped with the Oconee 1, 2, and 3 steam generators were reviewed relative to material certification, nondestructive testing during fabrication, and material heat number. The stud material is a high strength low alloy bolting material designated SA-320 GR-L43 (AISI 4340). This review indicated that the cracked Oconee Unit 3 studs were not limited to a single initial heat lot number. Studs of only three material heat lot numbers were shipped as original equipment on the primary manways of the Oconee Unit 3 steam generators and two heat numbers were represented in the group of cracked studs. All of the cracked studs were from the original supply of studs and had received a UT examination (prior to fabrication) and a magnetic particle (MT) examination (after fabrication).

Item 3(a)

The following changes to the techniques presently used for stud inspection are being reviewed and evaluated. Inclusion of these changes in future refueling inspection programs, as well as any other revision suggested by the results of the other investigations, will be determined after a thorough evaluation of each revision has been completed.

- (a) An ultrasonic technique for inservice examination of bolts and studs has been preliminarily evaluated. This technique is significantly more sensitive than the ASME Section V examination. It appears to have the capability of detecting stress corrosion cracks of the critical size ( $\sim 0.030$ " ).

The technique, which involves calibration on the bolt or stud threads, has been used for locating service failures at other locations. A program is underway to completely qualify the technique inhouse.

Status

A meeting was held between B&W, Duke Power Company, and Pacific Gas and Electric (PG&E) at PG&E's research center. It was demonstrated that a saw cut 0.016 inches deep could be detected under laboratory conditions using a 3/8" 10 Mhz probe. A program is underway to completely evaluate this technique. This will involve fabrication of standards, laboratory evaluation of techniques, training of technicians and field testing.

Item 3(b)

The swap out of entire sets of studs during inspections is being evaluated as a means to allow additional testing of the studs before reinstallation.

Status

Duke Power Company considers the improved inspection technique program to be the most promising and practical means for detection of cracked studs. Although the swap out of entire sets of studs during inspections is no longer being evaluated by Duke, it will still be considered in the event that the improved inspection technique does not prove viable in the field.

Item 3(c)

The performance of elongation tests on the studs before reuse is being evaluated.

Status

As with the previous item, Duke Power Company is no longer evaluating the performance of elongation tests because the improved inspection technique is considered to be the most promising and practical method for detection of defective studs. However, performance of these tests will be further considered should the improved inspection technique prove not to be viable in the field.

Item 4

The Oconee Nuclear Station procedures and the B&W instruction manuals regarding manway installation and removal are being reviewed to determine possible additions and improvements in the instructions detailing torquing techniques as well as the inspection and treatment of studs. Further review will evaluate the possible use of stud tensioning instead of torquing.

Status

Duke Power Company is considering a proposal from B&W concerning a program which includes performance of the above item. This proposal is discussed under Other Potential Actions, which follows.

Item 5

Information concerning the manner in which installation and removal procedures were performed on Unit 3 will continue to be gathered and reviewed to establish the effects, if any, on stud cracking.

Status

Duke Power Company torquing and detorquing procedures were reviewed relative to torquing limits, lubricants used, torquing sequence, cleaning procedures and notable anomalies. All procedures reviewed were found to be in general agreement with the steam generator instruction manual supplied by B&W. The B&W supplied instruction manuals contain detailed multiple step torquing procedures but do not specify detorquing limits nor special treatment and inspection of stuck studs and nuts. Special instructions were supplied by B&W for the detorquing and changeout of the studs at the lower primary manway of the B-SG at Oconee Unit 3 prior to plant startup. However, details of the manner in which these procedures are performed and the resulting contribution, if any, to the stud cracking concern has not been determined. This aspect is also covered under Other Potential Actions which is discussed below.

Item 6

An evaluation is being performed to estimate the primary leakage associated with the deflection of the primary manway cover resulting from the failure of five adjacent studs. This will provide useful information in defining the detectability of such leakage as well as the time required for such a condition to be identified.

Status

An engineering calculation has been performed by B&W which indicates that at least partial primary manway closure would be maintained with the complete failure of up to five adjacent primary manway studs assuming the remaining manway cover studs have maintained their original design integrity (i.e., they are not degraded studs). The structural integrity of the remaining studs is based on the ASME Code minimum ultimate strength values. The anticipated leakage rate with five adjacent failed studs is 20 to 40 gpm.

This leakage rate is well within the normal makeup capability of the unit. Primary leakage of this magnitude could be detected by increasing reactor building sump level, and by RCS leak rate calculations.

Item 7

Stud lubricants are being assessed to determine if an improved lubricant exists that does not dry out during system operation and that has better corrosion inhibitors.

Status

This item is addressed by the B&W proposal discussed under Other Potential Actions.

Other Potential Actions

Duke Power Company is presently considering portions of a program proposed by B&W in August, 1980. The objective of this proposal is to minimize the effects of the stud cracking problem and to address long term resolution. It is hoped that the program outlined by this proposal can be underway by mid-September. The parts of this proposal being considered by Duke Power Company to meet the above objective are as follows:

- a. Determination of inservice inspection direction. This task will:
  - Develop generic site inspection guidelines for the OTSG and pressurizer closure studs.
  - Define what could be done if a cracked stud is found.
  - Define a plan for developing in-place UT inspection techniques for smaller than 2" studs (e.g., primary handholes and secondary handholes and manways).
- b. Improved Assembly/Disassembly Guidelines. This task will:
  - Develop improved assembly/disassembly, handling, cleaning and storage guidelines for effected closures to reduce the stress applied to the closure studs.
- c. Determine if existing Operating Guidelines are adequate. This task will:
  - Determine whether existing operating guidelines adequately cover the possibility of closure stud failure.
- d. Identification of Corrodent. This task will:
  - Identify any corrodent species present on the fracture surface.
- e. Evaluation of Thread Lubricant. This task will:
  - Evaluate the contribution of Molykote to SCC.
  - Evaluate the potential benefits to be gained by using a substitute lubricant.