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Docket No. 50-249

NOV 08 1976

Commonwealth Edison Company
ATTN: Mr. R. L. Bolger
Assistant Vice President
Post Office Box 767
Chicago, Illinois 60690

Gentlemen:

The NRC Staff has completed its review of Commonwealth Edison's October 18, 1976 "Report on Reactor Feedwater Nozzle Ultrasonic Tests, Dresden Unit 3 and Quad Cities Unit 2". This report provided your analysis of the structural significance of flaw indications detected by ultrasonic investigations during the 1976 Inservice Inspection Program at Dresden Station Unit No. 3. A copy of our evaluation of the Dresden Unit No. 3 inservice inspection is enclosed.

Based on the available information, we have concluded that the Dresden Unit No. 3 feedwater nozzles are acceptable for continued operation for an additional 25 start-up/shutdown cycles. To assure timely evaluation of future operation you are required to submit a quarterly report indicating the number of start-up/shutdown cycles experienced at Dresden Unit No. 3 during Cycle 5 (Reload 4) operation and a detailed evaluation of the start-up/shutdown transients after 20 additional cycles. In addition, future inservice inspections of the feedwater nozzles are to be performed as described in the enclosed evaluation.

Sincerely,

Original signed by:
Karl R. Goller

Karl R. Goller, Assistant Director
for Operating Reactors
Division of Operating Reactors

Enclosure:
Evaluation

cc w/enclosure:
See next page

11/2/76

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DATE	10/28/76	10/29/76	11/4/76	11/8/76	

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EVALUATION OF DRESDEN UNIT NO. 3 INSERVICE INSPECTION

INTRODUCTION

An inservice inspection was performed by the Commonwealth Edison Company on Dresden Unit No. 3 to determine if thermal fatigue cracks were present in the feedwater nozzle inner blend radii or bore areas. The inspection was conducted using a modification of the recently developed Breda Ultrasonic (UT) Examination Technique. The examination results indicated possible significant UT indications at the inner radius of feedwater nozzle B and in the tangent area of feedwater nozzles A and D. Commonwealth Edison evaluated these indications and concluded that they were not significant.

A supplemental fracture mechanics analysis, employing the methods of Appendix A, Section XI of the ASME Code, was also provided by Commonwealth Edison to demonstrate that should an 8 mm deep thermal fatigue crack be present at the nozzle inner radius, the unit could operate a minimum of 45 start-up/shutdown cycles before the assumed flaw would propagate to a size that would require repair. This number of cycles is expected to be significantly greater than the number of start-up/shutdown cycles during the next fuel cycle.

EVALUATION

We and our consultants (Sandia Laboratories and Oak Ridge National Laboratories) have independently reviewed the UT examination results. Based on this review and the review of other field examination results for feedwater nozzles, we conclude that the presence of flaws and their general location might be determined by these methods provided the flaw extends through the clad thickness. However, considering the unique character and location of the thermal fatigue cracks, we believe UT methods do not currently have a sufficient data base to reliably characterize an indication and allow the UT results to be used as the sole basis to permit continued reactor vessel operation. Further , we do not agree with Commonwealth Edison's conclusion that the UT indications are insignificant. Our review indicates that sufficient evidence is provided by the UT examination results to allow us to assume that a thermal fatigue crack may exist at the nozzle inner radius.

For evaluation purposes, service experience is considered the appropriate basis to determine if an adequate margin of structural integrity for continued operation is indicated for Dresden Unit No. 3. Based on

service experience for thermal induced fatigue cracks in BWR feedwater nozzles, including the service experience and previous surface examination and repair methods at Dresden Unit No. 3, we conclude that a thermal fatigue crack no larger than 12 mm in depth could exist at the feedwater nozzle inner blend radius. Our evaluation is based on fracture mechanics techniques employing what are considered suitable upper bounds for stress intensity factor, cyclic crack growth, an appropriate lower bound for allowable flaw size and the initial 12 mm flaw indicated from service experience.

We agree with Commonwealth Edison that to meet the safety margin contained in Section XI of the ASME Code, the allowable flaw size can be reasonably approximated by a value equal to one-tenth the local vessel wall thickness. Additionally, our evaluation indicates that the stress intensity factor solutions provided by Commonwealth Edison are suitable for cyclic crack growth calculations. Using the allowable flaw size and stress intensity factor solution submitted by Commonwealth Edison, the initial 12 mm flaw size estimated from service experience and the upper bound cyclic crack growth curve for a water reactor environment from Section XI of the Code, we find that Dresden Unit No. 3 can operate an additional 25 start-up/shutdown cycles or until the next refueling outage, whichever comes first,

While we expect that the 25 cycles calculated in our evaluation may in the future prove to have an added degree of conservatism, additional cycles cannot be justified at this time because of the lack of a basis to evaluate the efficacy of the interference fit sparger at Dresden Unit No. 3 and the lack of experience with predicted crack growth rates in the absence of a surface examination at this refueling outage. Operation beyond 25 cycles therefore is dependent upon further evaluation of operating data. To facilitate this review, a detailed evaluation of the start-up/shutdown transients is required when Dresden Unit No. 3 attains 20 start-up/shutdown cycles. In addition quarterly reports indicating the number of cycles experienced at Dresden Unit No. 3 during Cycle 5 (Reload 4) should be submitted to the NRC.

Further feedwater nozzle inspections should be as follows: At the next scheduled refueling outage or any extended outage after 25 additional start-up/shutdown cycles have occurred, feedwater nozzles A, B and D should be volumetrically inspected, the spargers for these nozzles removed, and a dye penetrant examination of the nozzles' inner radius and bore regions performed. If thermal fatigue cracks are found in nozzles A, B or D, nozzle C should be inspected as described above.

Date: NOV 08 1976