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March 2, 1977

Mr. Dennis L. Ziemann, Chief
Operating Reactors - Branch 2
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Dresden Station Unit 2
Justification for Cancelling the
Feedwater Nozzle Mid Cycle UT Examination
NRC Docket No. 50-237

Dear Mr. Ziemann:

Enclosed is the justification for cancelling the feedwater nozzle mid cycle UT examination at Dresden Unit 2.

Please direct any additional questions on this matter to this office.

One (1) signed original and 39 copies are provided for your use.

Very truly yours,

R L Bolger

R. L. Bolger
Assistant Vice President

Enclosure

DRESDEN UNIT 2 - MID CYCLE UT WAIVER JUSTIFICATION

References (a): Letter to D. L. Ziemann from G. A. Abrell dated May 17, 1976.

(b): Letter to D. L. Ziemann from G. A. Abrell dated July 9, 1976.

(c): Letter to D. L. Ziemann from G. A. Abrell dated October 18, 1976.

(d): Letter to D. L. Ziemann from G. A. Abrell dated September 22, 1976.

(e): Letter to R. L. Bolger from K. R. Goller dated November 8, 1976.

In Reference (a), it was committed to perform a mid cycle UT of the Dresden Unit 2 feedwater nozzle blend radii. The examination was to be done during the first snubber inspection outage which is planned during the later part of March 1977. The commitment was made without the benefit of the analytical model for calculating crack growth as a function of startup/shutdown cycles using fracture mechanic techniques. Considering these subsequent developments, it is felt that the mid cycle UT will not provide any significant information; therefore, we are cancelling plans for mid cycle UT inspection.

During the Dresden Unit 2 1975 refueling outage, the four feedwater nozzle inner blend radii were thoroughly examined using liquid dye penetrant (PT) techniques. Approximately 400 linear indications were removed by grinding as evidenced by successive liquid penetrant tests following grinding. The maximum base metal penetration was one-quarter inch; one-half inch from the original clad surface. Subsequent to this grindout, a new set of interference fit spargers were installed replacing the original loose fit design. These interference fit spargers reduce feedwater leakage past the nozzle inner radius thus reducing thermal cycling of the nozzle blend radii. This 1975 PT inspection was described in a letter to D. L. Ziemann from G. A. Abrell dated May 12, 1976.

The next refueling outage for Dresden Unit 2 took place in Spring 1976. An ultrasonic inspection of the blend radii was performed using the method described in References (a) and (b). This method was a modified "Gatti" technique which was demonstrated to be capable of detecting a reflector penetrating the cladding into base metal. No indications above the recording level were observed on any of the four nozzles. Also during this outage, a dye penetrant examination of the lower accessible portion of the 240°F feedwater nozzle was performed. Of the nine indications found, two were selected to be grounded out to determine their depth. The indications were removed by grinding to a depth of 0.070 inches. These results were well within the limits of General Electric's Company's model for predicting crack initiation and crack growth.

In the fall of 1976, Dresden Unit 3 and Quad-Cities Unit 2 had their first refueling outages following sparger replacement and complete removal of all nozzle cladding cracks. Quad-Cities Unit 2 performed an ultrasonic inspection of the inner blend radii using a calibration standard similar to the examinations done on Dresden Unit 2 in May 1976. The inspection was also performed using Revision 0 of the procedure but with the Breda Block as the calibration standard. The examinations revealed one indication in each of the two nozzle inner radii. The details of this examination were reported in Reference (c).

The examination of the four inner radii of Dresden Unit 3 in 1976 was performed using the more representative feedwater nozzle mockup and its eight mm deep reference reflector for calibration. The examination performed on this basis identified one recordable indication.

The Dresden Unit 2 and Quad-Cities Unit 2 UT inspections performed using the reactor vessel standard for calibration were somewhat more sensitive than the inspections using the feedwater nozzle mockup for calibration. A comparison of the UT calibration procedures was provided in References (c) and (d).

Our fracture mechanics analysis, provided for Dresden Unit 3 and Quad-Cities Unit 2, demonstrated that should an eight mm deep thermal fatique crack be present in a three-eights inch deep previous grindout at the nozzle inner radius, the unit could operate through a minimum of 45 startup/shutdown cycles before the assumed flaw would propogate to a size that would require repair. The more conservative NRC evaluation, which assumed a 12 mm deep thermal fatique crack existed at the inner radius, concluded the unit could operate for an additional 25 startup/shutdown cycles before a repair would be required.

Our fracture mechanics analysis, mentioned above, was performed using conservative values for the stress intensity factor, cyclic crack growth, and allowable flaw size. It should also be noted that the crack growth curves were developed for a feedwater nozzle with a loose fit sparger. Furthermore, if actual operating data from Dresden's startup/shutdown cycles is considered, it has been recognized that the actual cycles are less severe than those used in deriving the analytical model for generating crack growth curves. The actual cycles appear not only to have fewer thermal transients associated with each startup/shutdown cycle, but also less severe temperature differentials than those used in the analytical model. With these added conservatisms, it is clear that the crack growth curves, used in the above mentioned evaluations, represent a conservative upper bound on crack growth potential. On the basis of applying our crack growth model to an eight mm deep crack in a maximum one-half inch deep previous grindout on Dresden Unit 2, a minimum of 40 startup/shutdown cycles are allowed before the crack requires repair.

On the basis of the NRC evaluations for Dresden Unit 3 and Quad-Cities Unit 2, Dresden Unit 2 could tolerate a minimum of 25 startup/shutdown cycles during its current fuel cycle before an assumed flaw would propogate to a point requiring repair. During this current fuel cycle, Dresden Unit 2 has experienced only 9 1/2 startup/shutdown cycles and based on operating history, is expected to have less than 20 startup/shutdown cycles by the next refueling outage scheduled for Fall 1977.

In doing a mid cycle examination of the blend radii on Dresden Unit 2, a considerable amount of personnel exposure would be taken (~1.5 man Rem) by the limited number of trained UT personnel available not to mention the exposure to support personnel expected to be approximately 8.5 man Rem. Considering the possible overlap in scheduling the mid cycle UT with the Quad-Cities Unit 1 refueling outage, available exposure of the UT personnel may become critical.

In conclusion, we consider a mid cycle UT of no benefit, because the fracture mechanics analysis methods developed for Dresden Unit 3 and Quad-Cities Unit 2 show that Dresden Unit 2 could operate a minimum of 40 startup/shutdown cycles before an assumed flaw of eight mm could propagate to the point requiring repair. The UT performed during the last refueling outage showed that the blend radii were free from recordable UT reflectors. Interference fit feedwater spargers were installed in 1975 to reduce thermal cycling. Dresden Unit 2 has experienced only 9 1/2 startup/shutdown cycles to this point in the fuel cycle and is not expected to approach the 25-cycle NRC limit by the fall refueling outages. Finally, the exposure that would be received in doing the mid cycle UT is considered unnecessary and in conflict with ALARA.