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March 12, 1984

Mr. H. R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. NUCLEAR REGULATORY COMMISSION
Washington, D. C. 20555

Attention: Mr. J. R. Miller, Chief
Operating Reactors, Branch 3

Gentlemen:

DOCKET 50-266
REACTOR VESSEL OUTLET NOZZLE-TO-SHELL
WELD INDICATION EVALUATION PROCEDURE
POINT BEACH NUCLEAR PLANT, UNIT 1

During Point Beach Unit 1 Refueling 11, an ultrasonic examination of the reactor vessel outlet nozzles was performed in accordance with ASME Boiler and Pressure Vessel Code Section XI. This examination was done to fulfill the first period requirements of the second ten-year interval. The second ten-year interval plan for Point Beach Nuclear Plant, Unit 1, was written to conform to the 1977 Edition of ASME Section XI with addenda through the summer of 1979. The examination is performed remotely and from the inside bore of the nozzle. Included in the inspection plan for this outage was an inspection of the nozzle-to-vessel shell weld, nozzle inside radius section, nozzle integral extension, and nozzle-to-pipe weld of both outlet nozzles. An examination of 100% of the vessel flange-to-shell weld was also done during the outage.

During the examination, indications were identified in the nozzle-to-shell welds of both outlet nozzles. These indications were recorded and sized in accordance with Regulatory Guide 1.150 and then evaluated against the standards provided in IWB-3000 of ASME Section XI. These indications were present during a previous examination in 1981 but were of lesser reflectivity. One indication in each outlet nozzle-to-shell weld exceeds the acceptable sizes listed in Table IWB-3512. The flaw indication located in the "A" outlet nozzle-to-shell weld which exceeds the acceptable size

A047
1/0

limits of Table IWB-3512 is in proximity to another individually acceptable indication. The evaluation was performed by an individual who is certified Level III in ultrasonic testing. These two indications fall within the root area of the weld. It is our opinion and that of our consultant, Southwest Research Institute, that the indications are the result of weld slag.

It is our intention to demonstrate that the flaws are acceptable and continued service is warranted by evaluation in accordance with IWB-3122.4 of ASME Section XI. As required by IWB-3122.4, the areas containing the indications will be reexamined in accordance with IWB-2420(b) and (c).

In accordance with IWB-3610(b), we are submitting for your concurrence our procedure for evaluating the acceptability of the indications:

1. Demonstration of Acceptance by Evaluation

   a. Evaluation based on linear elastic fracture mechanics and ASME Section XI, Appendix "A" (1977/S79):

      (1) Flaw characterization: The critical size flaw to be analyzed will be the largest indication, which is located in the "A" outlet nozzle at 104° azimuth. The flaw is characterized as a longitudinal subsurface flaw with an aspect ratio a/l = 0.32, and through thickness depth 2a = 1.24". Although a second flaw is in proximity and may possibly fall in the same plane such that $(a_1 + a_2) \leq (a_e + a_e')/2$ is not satisfied, it will be assumed that the smaller flaw indication will not contribute to the fatigue growth of the major flaw. This assumption is made based on the relative sizes of and spacing between the two indications. The second indication has a 2a dimension of 0.1" and a l dimension of 0.2"; thus, its area is less than 1% of the larger indication. Additionally, the second indication is spaced at least 1.26" from the edge of the larger flaw.

      (2) Integrity of the vessel with the flaw indications will be assessed for both the A and C outlet nozzles employing the following:

         (a) End-of-life predicted flaw.

         (b) Degraded fracture toughness arising from long-term irradiation.

(c) Normal, upset, emergency, and faulted load conditions.

(d) Acceptance criteria of IWB 3612:

(i) For normal and upset conditions:

$K_{1a}/K_1 \geq \sqrt{10}$ where K_{1a} is the arrest toughness and K_1 is the maximum applied stress intensity factor for normal, upset, and test conditions.

(ii) For emergency and faulted conditions:

$K_{1c}/K_1 \geq \sqrt{2}$ where K_{1c} is the fracture toughness based on crack initiation and K_1 is the maximum applied stress intensity factor under emergency and faulted conditions.

(3) Advanced fracture mechanics: If the evaluations performed in (2) above do not satisfy the acceptance criteria, then more detailed analyses will be performed. The steps, as determined necessary, may include:

(a) Detailed nozzle stress analysis.

(b) Elastic-plastic fracture analysis using the J/T approach.

(c) Refined flaw characterization.

(d) Enhanced inspection.

2. Submittal of the evaluation analyses of examination results as required by IWB-3125(b).

3. Reexamination in accordance with IWB-2420(b) and (c).

We are proceeding with the analysis as outlined above. Please advise us if you require any further information with respect to your approval of this procedure.

Very truly yours,

C. W. Fay

Vice President-Nuclear Power

C. W. Fay

Copies to NRC Resident Inspector
J. G. Keppler, Region III