NRC NEWS

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF PUBLIC AFFAIRS -- REGION I
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King of Prussia, PA 19406

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NOTE TO EDITORS:

The Nuclear Regulatory Commission has sent the attached letter to Consolidated Edison Company of New York, requesting additional information regarding the company's proposed plan to restart its Indian Point 2 nuclear power plant with the existing steam generators. The NRC staff has concerns regarding the assumptions made in the analysis provided by Con Ed. Without further information, the NRC is not able to reach a decision regarding the ability of the tubes to maintain their structural integrity for the period Con Ed proposes.

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attachment

July 20, 2000

Mr. A. Alan Blind
Vice President, Nuclear Power
Consolidated Edison Company
of New York, Inc.
Broadway and Bleakley Avenue
Buchanan, NY 10511

SUBJECT: STAFF CONCERNS AND REQUEST FOR ADDITIONAL INFORMATION REGARDING THE STEAM GENERATOR OPERATIONAL ASSESSMENT, INDIAN POINT NUCLEAR GENERATING UNIT NO. 2 (TAC NO. MA9288)

Dear Mr. Blind:

Shortly after the February 15, 2000, steam generator tube failure at Indian Point Nuclear Generating Unit No. 2 (Indian Point 2), the U.S. Nuclear Regulatory Commission (NRC) began a detailed technical dialogue with Consolidated Edison Company of New York, Inc., (ConEd, the licensee) to understand the root cause of the failure and the subsequent licensee corrective actions. ConEd provided the NRC with its root cause analysis of the February 15, 2000, tube failure in a letter dated April 14, 2000. Additionally, ConEd provided the NRC with a discussion of its corrective actions and justification for continued operation with the existing steam generators in its condition monitoring and operational assessment reports dated June 2 and July 7, 2000. In the June 2 report, ConEd provided its assessment of steam generator tube integrity to support a period of operation of 0.85 effective full-power years (EFPY) (about 10 effective full-power months) after restart. In the July 7 report which, in part, supplements the June 2 report by revising the U-bend and sludge pile operational assessments, ConEd stated that its commitment to the NRC to initiate steam generator replacement by late 2000 could shorten the operating length to as short as 4 months or 0.333 EFPY. It also discussed margin increases and analysis sensitivities based on decreasing the operating period.

Based upon its review to date, the NRC staff remains concerned about the ability of the unplugged tubes with low row (small radius) U-bends, and particularly row 3 U-bends, to satisfy the applicable tube integrity performance criteria. In the July 7 operational assessment report, ConEd attempted to show that these tubes would maintain their integrity for the requested operating period of 4 months prior to replacing the steam generators. The staff's concerns fall into three main areas: assumed probability (threshold) of detection, use of eddy current sizing data, and assumed material properties. Each of these areas is discussed in more detail below.

Assumed Probability of Detection (POD)

The assumptions regarding the ability to detect various size flaws in the low row U-bends using eddy current testing is based on data from straight sections of dented tubes. Because of the differences in geometry, it is unclear to the staff that these data are directly relevant to the assessment of the low row U-bends. In addition, it is unclear that "noise" level associated with the data from the dented tube samples is representative of the conditions in the low row U-bends in the Indian Point 2 steam generators. Independent analysis by the staff to "benchmark" the assumed detection capabilities have not resolved these concerns. The staff's review has shown that this issue is important because the operational assessment is very sensitive to the assumed POD which provides an estimate of the largest defect that might be missed by inspection resulting in it being left in service.

Use of Eddy Current Sizing Data

The steam generator operational assessment submitted by ConEd relies heavily upon eddy current sizing data. In light of the lack of a qualified eddy current method for sizing primary water stress corrosion cracking (PWSCC) in U-bends, it is important to account for the uncertainties associated with sizing stress corrosion cracks from eddy current data. Lack of destructive examination data to compare the sizes estimated from eddy current data to destructively measured flaw sizes in U-bends makes it difficult to assess the amount of uncertainty to apply in the operational assessment. Independent analysis by the staff to "benchmark" the assumed effectiveness of eddy current sizing have not resolved these concerns. For example, tube no. R2C74 which was sized during the spring 2000 inspections as being less than 40% in maximum depth (as measured by the 400 KHz probe) leaked during in-situ pressure testing. The pressure test results indicate that some portion of the crack was much deeper than indicated by the eddy current examination. In addition to this concern over sizing uncertainty, the staff believes that by virtue of the improved signal-to-noise ratio, the 800 KHz-based sizing measurements should be more accurate than the 400 KHz sizing data, used in the ConEd operational assessment. Use of the sizing estimates from the 800 KHz data results in larger estimated crack sizes and inferred burst pressures about 18% lower than those from the 400 KHz data. As with the concern about assumed POD above, the assumed sizing uncertainty is important because it also directly impacts the operational assessment in terms of what size defects could be left in service and crack growth rates.

Assumed Material Properties

As discussed in the June 2 operational assessment, your "reference assessment" is based on a best-estimate material flow strength, with a strain hardening adjustment. This assumption does not appear to account for the wide variability of this parameter as indicated by the material certification data for non-strain hardened tubing at Indian Point 2. The material flow strength uncertainty impacts the results of the operational assessment because it directly affects the pressure retaining capability of the tubing.

Based on the information submitted to date, the staff has been unable to conclude that the information presented in your operational assessment resolves these concerns. Thus, the staff cannot conclude that the applicable performance criteria will be satisfied for the proposed period of operation. Before the staff can make a final determination on your operational assessment, you will need to address these concerns. We are enclosing a request for additional information (RAI) to assist you in understanding our concerns by identifying specific areas wherein these concerns impact the methods, assumptions, analysis sensitivities and uncertainties related to your operational assessment. Therefore, your operational assessment must conclude that the tube integrity performance criteria will be satisfied for the proposed operating period, considering these sensitivities and uncertainties. After you have had time to consider the concerns, the staff is prepared to discuss this letter and RAI with you.

If you should have any questions, please contact Patrick Milano at 301-415-1457.

Sincerely,

/RA/

John A. Zwolinski, Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-247

Enclosure: Request for Additional Information

cc w/encl: See next page

REQUEST FOR ADDITIONAL INFORMATION REGARDING

OPERATIONAL ASSESSMENT OF LOW ROW U-BEND TUBES

INDIAN POINT NUCLEAR GENERATING UNIT NO. 2

DOCKET NO. 50-247

1. The July 7, 2000, submittal from Consolidated Edison Company of New York, Inc. (the licensee) refers to the consideration of an uncertainty distribution that was applied to the depth-based and area-based probability of detection (POD) curves for the low row U-bends. Confirm whether the staff's understanding is correct that the assumed uncertainty distribution refers to the full uncertainty range of the nominal fit to the data. Provide a chart illustrating the 95 percent confidence bounds on the nominal POD fit to the crack area data (similar to that done in Figure 6-1 for the nominal fit to average crack depth).

2. In its June 2, 2000, submittal, the licensee had previously provided the analysis sensitivity results for an assumed +5% shift of the depth-based POD in terms of percent through-wall. What is the sensitivity of the June 2 analysis to a 10% shift?

3. In its July 7 submittal, the licensee did not describe the sensitivity of the supplemental analysis results to a shift in the nominal crack area-based POD function. Provide the sensitivity of the analysis results to a 50% and 100% shift of the nominal area-based POD function in terms of crack area for a given POD value.

4. Describe the sensitivity of the analysis results to the assumed flaw size measurement error distributions. This sensitivity study should consider a 50% and 100% increase in standard deviation compared to what was assumed in WCAP-15128, "Depth-Based SG Tube Repair Criteria for Axial PWSCC at Dented TSP Intersections."

5. In the June 2 submittal, the licensee provided a sensitivity study that suggests that the use of 800 KHz sizing measurement instead of 400 KHz measurements reduces the end-of-cycle minimum burst pressure by only 2%. This appears inconsistent with the significantly higher flaw sizes calculated with data from the 800 KHz eddy current probe and that estimated burst pressures based on the 800 KHz measurements are an average of 18% lower than those based on the 400 KHz measurements. Provide an explanation for this apparent significant discrepancy.

6. Discuss in detail the basis for the assumption that the material flow stress is invariant with the initial non-strain hardened material properties. What is the sensitivity of the analysis results to consideration of the 95/95 lower tolerance limit material certification test results data for the tubes at Indian Point 2, adjusting for temperature and strain hardening? Alternatively, what is the sensitivity of the analysis to the consideration of the uncertainty distribution associated with the material certification data with appropriate adjustments for temperature and strain hardening?

Enclosure