



Consolidated Edison Company of New York, Inc.
Indian Point Station
Broadway & Bleakley Avenue
Buchanan, New York 10511-1099

January 15, 1988

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

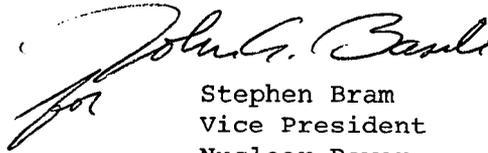
SUBJECT: Steam Generator Inservice Inspection: Followup Activity

This letter supplements our submittals of December 11, 1987 and December 23, 1987, as well as related telephone conversations, regarding the linear indications on the Indian Point Unit No. 2 steam generator shell to cone weldment as determined by ultrasonic inspections conducted during the current outage. By letter dated December 24, 1987, the NRC provided an SER on the subject and requested that we submit a report describing the repair program and our conclusions regarding the cause of the indications. We described our repair program and our conclusion regarding the cause at a meeting with your staff on December 14, 1987. We will additionally provide a followup report. We anticipate a submittal of that report by mid-February, 1988.

In addition, you have requested further information regarding the properties of the heat-affected zone material in the steam generator girth weld. Attachment I describes the scope and schedule for a program to provide such additional information.

Should you have any further questions, please contact us.

Very truly yours,


Stephen Bram
Vice President
Nuclear Power

attachment

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Attachment I

TESTING AND EVALUATION PROGRAM INDIAN POINT UNIT 2 STEAM GENERATOR SHELL TO CONE WELDMENT

A. GOAL

The purpose of the program is to investigate the properties of the heat affected zone (HAZ) material of the Indian Point Unit 2 steam generators No. 6 girth weld. The goal of the program is to investigate the relationship between hardness, microstructure and impact properties of material in the weld heat affected zones.

B. SCOPE

The program will involve a phased approach. Criteria are established for each phase and, if the criteria for phase 1 and/or 2 are met, then phase 3 will be omitted.

Phase 1: Review of Available Data and Fracture Analysis Sensitivity Study

A literature search will continue to be conducted to determine the information available on materials typical of those in the Indian Point Unit 2 steam generator upper shell to cone regions. Also, key investigators in this area will be contacted to see if data are available which have not been published.

A detailed evaluation of fracture toughness and other material properties will be performed to determine if a relationship between hardness, microstructure and impact properties has been established. A fracture analysis including both leak-before-break and critical flaw depth will be performed, using the governing transient for this region of the generator, i.e. the reactor trip. The best available fracture properties as determined from the literature search will be used to define the critical flaw depth and leak-before-break scenario.

A sensitivity study will also be performed to determine how low the fracture toughness could be, and how high the RT_{NDT} of the material could be while maintaining acceptable test results for a postulated surface flaw one half inch deep.

The criteria established for this phase of the investigation are as follows:

1. Critical Flaw Depth: > 0.5 in.
2. Transition temperature: $< 250^{\circ}\text{F}$
3. Upper shell toughness: > 160 ksi $\sqrt{\text{in}}$

Phase 2 Gleeble Simulation of HAZ Hard Zone in Charpy Blanks

Gleeble simulation of the weld thermal cycles will be made on 302B steel material Charpy blanks. The time temperature cycle to achieve the required HAZ hard zone will be established and verified to be typical of the high hardness zone in the shell to cone region by microstructure and hardness examination. Once the proper thermal cycle is developed and verified, a series of Charpy blanks will be produced with an adequately wide hardened zone representative of the steam generator weld HAZ. The blanks will then be machined with the Charpy V-notch positioned in the hardened zone. Charpy testing will be conducted to develop a full impact energy curve.

The criteria for this phase will be based on the Charpy transition temperature (NDTT) $\leq 250^{\circ}\text{F}$. If NDTT is found to meet this criteria, the acceptability of the HAZ material will be considered to have been demonstrated, and the program concluded. If further studies are required to establish what relationships between hardness, microstructure and impact properties exist for the weld heat affected zone material or criteria are not met, then phase 3 will be pursued.

Phase 3 Bulk Material Heat Treatment to Achieve Hard Microstructure

A bulk weldment, of adequate size will be prepared. Small sample blanks will be stress relieved at a range of temperatures to produce microstructures and hardness in the range observed in the S/G. ($R_C = 39$). The knowledge of the thermal cycle established during the Gleeble test phase will be utilized in choosing the stress relief temperatures and times. Optical metallography and hardness testing will be conducted to establish the microstructure and hardness level of the specimens. Both Charpy and drop weight testing will be performed on these specimens.

The criterion for this phase will be based on the same RT_{NDT} ($\leq 250^{\circ}\text{F}$).

C. SCHEDULE

The anticipated schedule for the program discussed above based upon NRC concurrence is as follows:

<u>PHASE</u>	<u>DURATION</u>
1 and 2	on or before 1 April 88
3	on or before 1 June 88

The status of the ongoing program will be periodically provided to the NRC Project Manager.