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NED-84-401

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Director of Nuclear Reactor Regulation
Attention: Mr. John F. Stolz, Chief
Operating Reactors Branch No. 4
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

NRC DOCKET 50-366
OPERATING LICENSE NPF-5
EDWIN I. HATCH NUCLEAR PLANT UNIT 2
EXAMINATION OF INCONEL 182-BUTTERED
RECIRCULATION SYSTEM NOZZLES

Gentlemen:

During the June 5, 1984 BWR Regulatory Response Group meeting with the NRC, Georgia Power Company indicated that during the Hatch Unit 2 outage currently in progress it would examine the six (6) remaining Recirculation System safe end-to-nozzle welds not examined during the Spring 1983 maintenance/refueling outage. We further indicated that the results of those examinations would be reported to the NRC. Examination of these six welds was prompted by the discovery of cracking in Inconel 182-buttered Recirculation System nozzles and safe ends at Boston Edison's Pilgrim plant as discussed in NRC I&E Notice 84-41. Enclosed as Attachment 1 is a discussion of the examinations conducted on the six inlet and outlet nozzles and safe ends at Hatch Unit 2 and the results thereof.

In addition to the aforementioned examinations, the Recirculation System Jet Pump Instrumentation Nozzle welds were examined during the current Hatch Unit 2 outage. These examinations were prompted by cracking problems observed at Tennessee Valley Authority's Browns Ferry and Northern States' Monticello plants as discussed in I&E Notice 84-41. Examined at Hatch Unit 2 were the safe end-to-nozzle welds and the safe end-to-penetration seal welds on the jet pump instrumentation nozzles. Enclosed as Attachment 2 is a discussion of the examinations conducted and the results thereof.

Please be advised that NRC Region II monitored the aforementioned examinations at Hatch Unit 2.

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Should you have any questions in this regard, please contact this office.

Sincerely yours,

L. T. Gucwa

JAE/mb

Enclosures

xc: H. C. Nix, Jr.
Senior Resident Inspector
J. P. O'Reilly (NRC-Region II)

ATTACHMENT 1

EXAMINATION OF INCONEL 182-BUTTERED
RECIRCULATION SYSTEM INLET AND OUTLET NOZZLES
AT HATCH UNIT 2

The discovery of intergranular stress corrosion cracking (IGSCC) in the Inconel 182-buttered Recirculation System nozzles and safe ends at Boston Edison's Pilgrim plant and subsequent notification of Georgia Power Company (GPC) by NRC I&E Notice 84-41 prompted an investigation of the problem by GPC and the Southern Company Services (SCS) Inspection, Testing, and Engineering Section.

Hatch Unit 2 has Inconel 182-buttered Recirculation System inlet and outlet nozzles, but not safe ends, and the weld joint was made entirely with Inconel 182. The Type 304 stainless steel safe end has a very low carbon content (.026%) and is generally thought to be not susceptible to IGSCC.

To ensure the inspectability of these welds at Plant Hatch, SCS purchased a 12" nozzle mockup having Inconel buttering and an Inconel weld from Southwest Research Institute. The mockup contained axial and circumferential notches of varying depths when received. The block was then modified by SCS by machining two-10% I.D. notches in the Inconel weld area. These two notches were approximately one-half the depth of the cladding on the nozzles, with one notch in the axial direction and the other in the circumferential direction. Scanning was performed on the mockup using an Aerotech 1.5 MHz, dual element (each element 1/2" x 1/2"), 45° shear wave transducer which was calibrated on the Hatch calibration block. All notches were distinguishable from the clad roll.

Liquid penetrant (PT) examinations were then performed on the five "A" Loop 12" inlet safe end-to-nozzle welds and one "B" Loop 28" outlet nozzle-to-safe end weld. One 12" inlet safe end-to-nozzle weld and the one 28" outlet nozzle-to-safe end weld were observed to have reportable PT indications which were subsequently removed by light buffing. After the penetrant exams, an ultrasonic examination (UT) was performed on each of the subject welds by personnel who had successfully evaluated the notches in the mockup. The dual element transducer was used to examine the weld from the nozzle side and a 3/8", 1.5 MHz, 45° shear wave transducer was used to examine the weld from the safe end side. Indications were detected, plotted and resolved to be from the weld interface or clad roll.

A General Electric (GE) mockup used at Pilgrim consisting of an Inconel buttered nozzle, Inconel weld, and stainless steel safe end was then sent to Plant Hatch. Using the dual element transducer the notches were detectable in the GE mockup; however, a decision was made to evaluate other transducers. A Sonic 1.5 MHz 1/2" x 1/2", 45° shear wave transducer, which was previously used for weld overlays, was then chosen because it provided a more distinct signal from the notches. Also, the screen presentation was spread apart so that the notch signal could be more easily distinguished from the clad roll or weld interface signal.

An evaluation of the indications previously detected using the dual element transducer was then performed by scanning with the Sonic 1.5 MHz transducer. All indications were resolved by an SCS Level III as water signals caused by an air pocket in the line, clad roll, or interface reflections.

In conclusion, interface problems do exist; however, the use of the mockups showed that sufficient sound penetrates the interface to examine the Inconel. With personnel training on the mockup, so that the signals on the screen display are recognizable, it is the position of GPC and the SCS Inspection, Testing, and Engineering Section that significant cracking would have been detected.

ATTACHMENT 2

EXAMINATION OF RECIRCULATION SYSTEM JET PUMP
INSTRUMENTATION NOZZLES AT HATCH UNIT 2

No relevant ultrasonic (UT) indications were observed by the Southern Company Services Inspection, Testing and Engineering Section in either the nozzle buttering or butt weld of the Recirculation System Jet Pump Instrumentation Nozzle at the nozzle-to-safe end welds. In addition to the ultrasonic examination, a dye penetrant (PT) examination of the welds was performed. Reportable dye penetrant indications were observed on the "A" Loop, but, were of code allowable size and accepted "as is". The subject welds, including nozzle buttering, were made with Inconel 182. The Type 304 stainless steel safe ends for these particular nozzles are not buttered with Inconel and have a very low carbon content (.026%).

Several UT indications were observed on both "A" and "B" loop Jet Pump Instrumentation Nozzles at the safe end-to-penetration seal welds. The indications observed in the safe end side are axial, approximately 2" long and run from the weld to a tapered change in thickness that cannot be inspected by UT. The indications do not appear on the far side of the taper in the thicker section of the safe end. They are detected on the UT instrument screen in a position representing a half vee-path node. The indications are evaluated as not representing material defects with the following justification:

1. No indications were detected in the first half vee-path, but, were detected later in time,

2. No indications could be detected scanning the entire circumference using a pitch-catch technique with the transducers positioned at a full vee-path and monitoring the received reflection (Note-this technique detected the cracking at Browns Ferry),

3. None of the indications can be detected from both clockwise and counterclockwise scan,

4. Dampening the signal at one full vee-path node did not result in a loss of amplitude from indications that appeared to be detected in the second vee-path node, and

5. The safe ends are low carbon Type 304 stainless steel (.026%) and were not furnace sensitized.

In addition to the UT examination of the safe end-to-penetration seal welds, a PT of the welds was conducted. No reportable indications were observed.