TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

June 3, 1983

BLRD-50-438/83-15
BLRD-50-439/83-11

U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30303

Dear Mr. O'Reilly:

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2 - TUBE LEAKS IN COMPONENT COOLING WATER HEAT EXCHANGERS - BLRD-50-438/83-15, BLRD-50-439/83-11 - SECOND INTERIM REPORT

The subject deficiency was initially reported to NRC-OIE Inspector D. M. Verrelli on January 24, 1983 in accordance with 10 CFR 50.55(e) as NCR 2174. This was followed by our interim report dated February 18, 1983. Enclosed is our second interim report. We expect to submit our next report by November 7, 1983. We now consider 10 CFR Part 21 applicable to this deficiency.

If you have any questions, please get in touch with R. H. Shell at FTS 858-2688.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Enclosure
cc: Mr. Richard C. DeYoung, Director (Enclosure)
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Records Center (Enclosure)
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

ENCLOSURE

BELLEFONTE NUCLEAR PLANT UNITS 1 AND 2
TUBE LEAKS IN COMPONENT COOLING WATER HEAT EXCHANGERS
BLRD-50-438/83-15, BLRD-50-439/83-11
10 CFR 50.55(e)
NCR 2174
SECOND INTERIM REPORT

Description of Deficiency

The component cooling water (CCW) coolers are straight tube heat exchangers with essential raw cooling water (ERCW) circulated through the tube side. The CCW coolers are in the main flow path for the ERCW system. ERCW has been periodically circulated through the CCW coolers to provide cooling water to other components. Tube leaks have developed in the loop A cooler in both units 1 and 2. No leaks have yet been detected in the loop B coolers. Before beginning this periodic ERCW circulation, the CCW coolers were hydrotested at Bellefonte, and none of the CCW coolers had leaking tubes at that time.

Interim Progress

One leaking tube has been removed from each of the A train heat exchangers and subjected to a metallurgical examination. Results of the examination indicated that the damage mechanism was corrosion pitting. No evidence of vibration damage or stress corrosion cracking was found. A sample eddy current (EC) examination (10 percent of the tubes) of the A and B train coolers on both units was performed to determine the extent of the corrosion pitting. Results indicated that a majority of the tubes in the units 1 and 2 A train heat exchangers contain significant degrees of tube wall reduction due to corrosion pitting. The units 1 and 2 B train heat exchanger tubes were found to contain no corrosion pitting. (Pump operational records indicate that the A train coolers have been in service approximately twice as many hours as have the B train coolers.)

A literature search was initiated to obtain information on the operating experience of the tube material (SB-111, 90/10 copper-nickel) in raw water service. Many references were found to pitting failure in 90/10 CuNi tubes when the flow velocity of raw water through the tubes is less than 5 ft/sec. At flow velocities less than 5 ft/sec, particulate matter in the raw water is not swept clean of the tubes. The sediment in contact with the tube walls forms an anaerobic cell, resulting in the formation of a pit. At velocities greater than 5 ft/sec, particulate matter is swept clean of the tube surface, no anaerobic cells are allowed to form and corrosion pitting is not a problem.

The design flow velocity of raw water in the Bellefonte CCW heat exchangers was specified by B&W's subvendor, Struthers Wells Corporation, Warren, Pennsylvania, as 3 ft/sec. Operation of the CCW heat exchangers at this velocity resulted in conditions conducive to corrosion pitting. Unfortunately, due to space limitations and the resulting pipe rerouting, the existing heat exchangers cannot be redesigned to increase the flow velocity above 5 ft/sec.

TVA is investigating other alloys in order to consider a possible replacement of the tubes in the heat exchangers. TVA is continuing its examination of the failed tubes to make sure that the pitting behavior is consistent and not related to possible differences in tube composition.