831 Power Building
TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

Howe

March 4, 1976

Dr. Donald F. Knuth, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, DC 20555

296

Dear Dr. Knuth:

BROWNS FERRY NUCLEAR PLANT UNIT 3 - REPORTABLE DEFICIENCY - POTENTIAL FOR RHR PUMP OPERATION BEYOND RUNOUT CONDITION

Initial report of the subject reportable deficiency was made to H. C. Dance, NRC-IE, Region II, on February 3, 1976. In compliance with paragraph 50.55(e) of 10 CFR Part 50, we submit the enclosed interim report of the deficiency.

Very truly yours,

J. E. Gilleland
Assistant Manager of Power

Enclosure
CC (Enclosure):
Mr. Norman C. Moseley, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region II - Suite 818
230 Peachtree Street, NW.
Atlanta, Georgia 30303

ENCLOSURE

BROWNS FERRY NUCLEAR PLANT UNIT 3
POTENTIAL FOR RHR PUMP OPERATION IN EXCESS OF DESIGN RUNOUT
DDR 224
INTERIM REPORT

Description of Deficiency

A single failure analysis of proposed modifications to the Residual Heat Removal (RHR) System for units 1 and 2 identified a potential single failure in the present plant configuration for all three units. This single failure occurring after a loss of coolant accident (LOCA) could result in short-term RHR pump operation in excess of design runout. This was considered an unacceptable challenge to pump availability since two RHR pumps are required for long-term containment cooling.

Cause of Deficiency

During a LOCA, the low pressure coolant injection (LPCI) logic for the RHR System calls for the injection of water from four RHR pumps through an unbroken recirculation loop to the reactor vessel. A single active component failure in this logic could result in incorrect loop selection and direct all four RHR pumps to flow to the break. A break in the recirculation loop discharge line is the limiting situation. A significant increase in total system flow above the design condition will result due to the loss of recirculation loop jet pump flow resistance (which constitutes over 50 percent of the total system flow resistance). The resulting flow has been shown by calculations to exceed the runout capacity of the pumps, as determined from the pump manufacturer's test data. A single failure in the logic could also result in four RHR pumps injecting into both recirculation loops simultaneously, with one loop broken. This is the limiting case.

Another single failure that was considered, and found to be less limiting was the case where the loop selection was performed correctly for a recirculation line break, but the recirculation pump discharge valve in the unbroken loop fails to close. This results in an additional flow path through the recirculation pump to the reactor vessel. This path is in parallel with the normal one through the jet pumps, but has a much lower flow resistance. This could also result in RHR pump operation in excess of design runout, but it is not the limiting case.

Safety Implications

The RHR injection mode is not needed for short-term core cooling for either of the two cases discussed. However, the operation of the RHR pumps in excess of design runout presents a potential challenge to the availability of the pumps since they are needed for long-term containment cooling. A minimum of two RHR pumps and associated heat exchangers must be operable for long-term containment cooling.

Description of Corrective Action

An orifice will be installed in the discharge piping of each RHR pump. The orifices will be sized so that three pumps will supply adequate flow in the LPCI mode to maintain fuel temperature below established limits. They will also provide the necessary flow resistance to prevent the four RHR pumps from exceeding their design runout flow capability following the worst case single failure. Confirmatory tests will be conducted with the orifices installed to compare the required RHR system flow characteristics with the acutal characteristics. Results of the conformatory testing will be included in a final report.

Means Taken to Prevent a Recurrence

The addition of pump discharge orifices will correct the design deficiency and thus eliminate the possibility of RHR pump operation in excess of design runout due to the postulated single failure.

ACTION ITEM CONTROL FORM

NRC 56
2-75

Y file !

TRACK NUMBER			A/I TYPE
SNDNG OFF.	SEQUENCE NUMBER	RCVNG OFF.	
110	1172	F2	25

PRIORITY: N

FACILITY: BRF-3

INITIAL ENTRY DATE: 03-12-76

REQUESTED COMPLETION DATE: 06-01-76

REQUESTOR: GOWER

AUTHORIZED BY GWR

ACTION ITEM DESCRIPTION: POTENTIAL FOR RHR PUMP OPERATION BEYOND RUNOUT CONDITION.

ACTION REQUESTED: Please review the adequacy of the licensees' corrective action to resolve this CDR item.

REMARKS/REFERENCES: Letter from TVA to Knuth (with autorun report) dtd 3/4/76

	EXPECTED COMPLETION DATE
1	- -
2	- -
3	- -
4	- -
5	- -
6	- -
7	- -
8	- -
9	- -
10	- -

Serviced via Wheeler
Jerry Klingler
Date surfaced to SB - John Stolz
21

PERSON ASSIGNED

MILESTONE

MAN HOURS EXPENDED

TOTAL MAN HOURS →

CLOSEOUT METHOD

CLOSEOUT ACTION

ACTION COMPLETE DATE: - -

CODE