TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE
37401

50-259

March 21, 1974

Mr. John F. O'Leary, Director
Directorate of Licensing
Office of Regulation
U.S. Atomic Energy Commission
Washington, DC 20545

Dear Mr. O'Leary:

TENNESSEE VALLEY AUTHORITY - BROWNS FERRY NUCLEAR PLANT UNIT 1 - DOCKET NO. 50-259 - FACILITY OPERATING LICENSE DPR-33 - ABNORMAL OCCURRENCE REPORT BFAO-7414W

The enclosed report is to provide details concerning possible maloperation of HPCI which occurred on Browns Ferry Nuclear Plant unit 1 on March 11, 1974, and is submitted in accordance with Appendix A to Regulatory Guide 1.16, Revision 1, October 1973.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

E. F. Thomas
Director of Power Production

Enclosure
CC (Enclosure):
Mr. Norman C. Moseley, Director
Region II Regulatory Operations Office, USAEC
230 Peachtree Street, NW., Suite 818
Atlanta, Georgia 30303

2500

COPY SENT REGION II

ABNORMAL OCCURRENCE REPORT

Report No.: BFAO-7414W
Report Date: March 21, 1974
Occurrence Date: March 11, 1974
Facility: Browns Ferry Nuclear Plant unit 1

Identification of Occurrence

Possible maloperation of HPCI.

Conditions Prior to Occurrence

A planned load rejection test from the 75-percent power level plateau was in progress.

Description of Occurrence

In the review of data collected concerning the load rejection test, conflict exists as to the events which transpired concerning the HPCI. Immediately following test initiation, the main turbine control and stop valves shut and the reactor scrammed. Reactor water level decreased rapidly because of the sudden pressure increase; and, at approximately eight seconds after the initiating event, a low water level was reached causing the MSIV's to isolate and the HPCI to start. At approximately 15 seconds after initiation, a peak pressure between 1,070 and 1,080 psig was reached. Reactor water level had returned to above its normal level within 30 seconds. At approximately 5 minutes and 30 seconds in the transient with the water level at 52", the operator manually opened a relief valve to decrease pressure. The reactor water level swelled above the 54" HPCI trip point and remained there while the relief valve was opened--approximately 1 minute. Conflict exists as to HPCI operation during this interval. The operator logged that the HPCI tripped on overspeed five minutes after the main turbine trip. This cannot be substantiated by recorder charts of water level and HPCI injection flow. It is believed that the operator actually observed the HPCI high water level trip signal which accompanied the manual relief valve operation. Numerous individuals observed the HPCI start at the beginning of the transient when a reactor water level depression was experienced. One plant electrical engineer states that he saw the HPCI isolate because of high steam flow within seconds of its initiation. The control room operator, who had many events requiring his attention, states that soon after the low reactor water level recovered, he set the HPCI controller for minimum flow but did not actually observe HPCI running. The HPCI injection flow recording chart shows a flow spike of moderate intensity near the beginning of the transient followed by a 15-minute period of zero flow, and then a period of flow higher than the initial spike of a duration of perhaps five minutes. This later spike occurred when HPCI was manually operated.

Designation of Apparent Cause of Occurrence

The recorded data and the statement of one plant engineer that he saw the equipment trip on high steam flow is cause for concern. From the data collected during the transient, it is highly improbable that HPCI performance during this test will ever be known with certainty. The purpose of the test was not to observe HPCI performance, and its action was only of peripheral interest. The HPCI has previously operated correctly when started with normal reactor pressure. This is the first time HPCI has ever been actuated automatically with pressure approximately 100 psi above normal. Because there is a possibility that starting the HPCI with abnormally high pressure will in fact result in an excessive steam flow above the trip setpoint, this must be investigated further. The operator logged that HPCI tripped on overspeed five minutes after the main turbine trip. This is highly unlikely and cannot be substantiated by recorder charts of reactor water level and HPCI injection flow. It is believed that at approximately five minutes after the main turbine trip, the HPCI was not operating; but, if it were, it would have tripped on the high water level which accompanied the manual relief valve actuation.

Analysis of Occurrence

The reactor was never jeopardized during this test by HPCI performance. Reactor water levels were such that injection was never required, and the HPCI and RCIC were available for manual operation if required.

Corrective Action

Conditions similar to those which existed at the time of interest cannot be duplicated during normal reactor operation. The plant startup test program requires a similar load rejection test to be conducted from the 80-percent power level. HPCI response during this test will be closely monitored, and corrective action will be based upon the results found at that time.

Failure Data

Investigation subsequent to abnormal occurrence BFAO-7338 has shown that a high steam flow HPCI isolation will occur if the HPCI auxiliary oil pump is placed in operation before the HPCI steam supply valve is opened. This investigation has also shown that HPCI isolation does not occur on automatic actuation of the HPCI system if the auxiliary oil pump is started simultaneously with the opening of the steam supply valve. These observations can be explained by analyzing the operation of the HPCI steam turbine control system. The control system operates such that, when oil pressure is made available to the control system (starting the auxiliary oil pump), the system will open the turbine control valve even though the turbine is not running. With the turbine control valve open, the initial surge of steam, when the steam supply valve is open, is large enough to initiate HPCI steam flow isolation. The steam flow isolation design setpoint thus appears to be marginally low. After careful consideration of potential pipe break problems as well as HPCI startup transients, both TVA and GE design have previously recommended not increasing the high flow d/P switch setting so as to give maximum protection for all high energy pipe breaks. A calibration check of HPCI steam flow isolation instrumentation was performed following this occurrence and instrument calibration was found to be within acceptable limits.