Tennessee Valley Authority, 1101 Market Street, Chattanooga, Tennessee 37402

APR 01 1991

WBRD-50-390/91-06 10 CFR 50.55(e)

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of the Application of) Docket No. 50-390
Tennessee Valley Authority)

WATTS BAR NUCLEAR PLANT (WBN) UNIT 1 - DEFECTIVE CONVERTER MODULES IN ACCIDENT MONITORING INSTRUMENTATION - WBRD-50-390/91-06 - FINAL REPORT

The subject deficiency was initially reported to NRC Region II on February 28, 1991, in accordance with 10 CFR 50.55(e) as Significant Corrective Action Report WBSCA 910153, Revision 0. Enclosure 1 provides TVA's final report. Enclosure 2 provides the commitment for this submittal.

If there are any questions, please telephone P. L. Pace at (615) 365-1824.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

Mark J. Burzynski for
E. G. Wallace, Manager
Nuclear Licensing and
Regulatory Affairs

Enclosures
cc: See page 2

IE27

U.S. Nuclear Regulatory Commission

APR 01 1991

cc (Enclosures):

Ms. S. C. Black, Deputy Director
Project Directorate II-4
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

INPO Record Center
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

NRC Resident Inspector
Watts Bar Nuclear Plant
P.O. Box 700
Spring City, Tennessee 37381

Mr. P. S. Tam, Senior Project Manager
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

Mr. B. A. Wilson, Chief, Project Chief
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, NW, Suite 2900
Atlanta, Georgia 30323

ENCLOSURE 1
WATTS BAR NUCLEAR PLANT (WBN) UNIT 1
DEFECTIVE CONVERTER MODULES IN ACCIDENT MONITORING INSTRUMENTATION
SIGNIFICANT CORRECTIVE ACTION REPORT WBSCA 910153
WBRD-50-390/91-06 - 10 CFR 50.55(e) FINAL REPORT

Description of Deficiency

By letter of October 29, 1990, (NS-NRC-90-3547) Westinghouse Electric Corporation notified NRC pursuant to 10 CFR 21 of a potential substantial safety hazard relating to electrical component failures in safety-related instrumentation. As described in that letter and in a Westinghouse letter to TVA of November 7, 1990 (WAT-D-8379), the potential failures involve Burr-Brown model 724 DC-DC converter modules manufactured in 1988, 1989, and 1990. The failures occur within the range of abnormal temperature conditions for which the modules are qualified. Specifically, Westinghouse qualified these modules for 135°F (ambient temperature of 120°F plus 15°F for internal rack heat up). During testing conducted by Westinghouse, failures of 1988/1989 date code devices were experienced at 131°F and of 1990 devices at 113°F. The devices are used in various Westinghouse designed instrumentation systems including Eagle 21 Process Protection System (PPS), Reactor Vessel Level Instrumentation System (RVLIS), and the Inadequate Core Cooling Monitoring (ICCM) System.

To determine the applicability of this deficiency at WBN, an inspection was performed by Westinghouse site representatives and WBN personnel. The equipment inspected included the Eagle 21 PPS and the ICCM System which replaces WBN's RVLIS. The inspection of the ICCM racks and spare boards (purchase contract 71C62-54114-1) identified 24 printed circuit boards containing BB724 modules with the suspect date codes. The part numbers and rack locations for these boards are given in the attachment. Sixteen of the boards are located in ICCM instrument racks 1-R-179 and 1-R-180 which have not been installed in their permanent plant location. They are presently stored with 8 spare boards in an onsite warehouse (Nuclear Stores, Hut number 13). Inspection of the installed Eagle 21 cabinets 1-R-2, 1-R-6, 1-R-10, and 1-R-13 revealed no BB724 modules with a 1988/1989/1990 date code.

To determine the cause of failure, Westinghouse conducted a test program and found that when certain date codes of BB724 devices were subjected to elevated temperatures, two transistors within the circuitry conducted simultaneously causing an overcurrent condition resulting in a failure of the device. Specifically, the deficiency resulted in an open circuit of the driver transistors for the primary transformer winding of the DC/DC converter module.

Although the WBN Unit 2 ICCM also contains the defective modules, the Unit 2 equipment has not been shipped to WBN. Westinghouse will have replaced the defective Unit 2 boards before shipment to WBN site.

Safety Implications

The following functions are served by the ICCM and could be adversely affected by the subject deficiency: primary operator display for subcooling margin, primary operator display for core temperature (incore thermocouple temperature),
and primary operator display for reactor vessel level. These functions are considered key variables in Regulatory Guide (RG) 1.97[1]. Subcooling margin and incore thermocouple temperature provide primary information needed by the control room operator to take manual actions required for safety systems to mitigate design basis accident events. Reactor vessel level provides information to indicate whether plant safety functions are being accomplished.

The normal operating environment for the ICCM safety-related instrumentation systems is approximately 24°C (75°F). Because the maximum abnormal temperature (104°F) for this environment is anticipated less than 1 percent of plant lifetime, the liklihood of failure of the BB724 devices is low. However, if during an elevated temperature condition, a common mode failure of all of the subject BB724 devices were to occur, both incore thermocouple temperature and reactor vessel level would be unavailable or inaccurate and incapable of performing their intended safety function. ICCM subcooling margin is based on incore thermocouple temperature (affected by the defective device) and wide range reactor coolant system (RCS) pressure (not affected). Therefore, both the main control room display and the subcooling meter driven by ICCM would be adversely affected rendering the subcooling readings inaccurate and incapable of providing the operator with correct information necessary to accomplish safety functions. However, backup unqualified indication of subcooling margin is available from the plant computer which uses RCS wide range temperature and pressure to determine subcooling margin.

Corrective Action

As noted in the Westinghouse October 29, 1990 letter, Westinghouse and Burr-Brown have developed and successfully tested circuit modifications which support reliable operation of the BB724 devices.

In accordance with corrective actions recommended by Westinghouse, the 24 input/output boards listed in the attachment will be returned to Westinghouse for replacement of the BB724 integrated circuit chips. After repair and retesting of the boards by Westinghouse, they will be reinstalled in WBN's ICCM racks with spares returned to storage. This action will be completed before the system completion date for Group 4 systems.

1. RG 1.97, "Instrumentation For Light-Water-Cooled Nuclear Power Plants To Assess Plant and Environs Conditions During and Following an Accident"

ATTACHMENT

WBN ICCM I/O Boards Containing BB724 Converter Modules with Date Codes of 1988/1989/1990

I/O BOARD (MODEL NUMBER)	I/O BOARD (SERIAL NUMBER)	TERMINAL FRAME
TRAIN A (Rack 1-R-179)		
2334D64	208	TB101
2343D99	227	TB103
2343D99	225	TB104
2342D98	210	TB106
2342D98	212	TB107
2342D98	217	TB108
2342D98	219	TB109
2343D99	056	TB111
TRAIN B (Rack 1-R-180)		
2334D64	207	TB101
2343D99	226	TB103
2343D99	223	TB104
2342D98	214	TB106
2342D98	215	TB107
2342D98	220	TB108
2342D98	227	TB109
2343D99	052	TB111
SPARES		
2343D98	216	N/A
2343D98	224	
2343D98	227	
2343D98	228	
2343D99	219	
2343D99	222	
2343D99	224	
2343D99	054	

ENCLOSURE 2

LIST OF COMMITMENTS

Reinstall the 24 Input/Output boards listed in the attachment after repair and testing by Westinghouse before system completion for Group 4 systems.