TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

5N Lookout Place

JAN 11 1991

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

Gentlemen:

In the Matter of ) Docket No. 50-328
Tennessee Valley Authority )

SEQUOYAH NUCLEAR PLANT (SQN) - UNIT 2 - EAGLE 21 START-UP REPORT

Reference: NRC letter to TVA dated October 31, 1990, "Reactor Protection System Upgrades and Enhancements (TAC 75844) (TS 89-27) - Sequoyah Nuclear Plant, Unit 2"

As indicated in the reference, TVA committed to submit a report describing design hardware, design software, and maintenance problems with Eagle 21 encountered during Unit 2 start-up and power ascension from the Cycle 4 refueling outage. The information in the enclosure is provided to satisfy this commitment. This report covers the period of November 2 (Unit 2 Mode 4 entry), through December 11, 1990 (Unit 2 at nominal 100 percent power).

If you have any questions concerning this issue, please contact Keith C. Weller at (615) 843-7527.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

Mark J. Burzynski for

E. G. Wallace, Manager
Nuclear Licensing and
Regulatory Affairs

Enclosure
cc: See page 2





IE26
1/1

cc (Enclosure):
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

Mr. J. N. Donohew
Project Manager
U.S. Nuclear Regulatory Commission
One White Flint, North
11555 Rockville Pike
Rockville, Maryland 20852

NRC Resident Inspector
Sequoyah Nuclear Plant
2600 Igou Ferry Road
Soddy Daisy, Tennessee 37379

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

ENCLOSURE

SQN Eagle 21 Unit 2 Start-Up Report For
Period November 2 Through December 11, 1990

During the period of November 2 through December 11, 1990, Unit 2 initiated Mode 4 operation through 100 percent reactor power for Cycle 5. During this period, four test sequence processor (TSP) lock-ups occurred as follows:

| Rack No. | Date |
|---|---|
| 2 | November 11, 1990 |
| 13 | November 14, 1990 |
| 2 | November 30, 1990 |
| 2 | December 1, 1990 |

The TSP lock-ups were identified by the receipt of a channel set failure alarm in the main control room with no corresponding bistable trips for that channel. A TSP lock-up is characterized by status light emitting diodes (LEDs) in the rack, indicating that the TSP has stopped functioning. Although some normal online diagnostics are lost during a TSP lock-up, the loop calculation processor (LCP) remains functional and operable. No other plant equipment was affected. The lock-ups were discussed with Westinghouse Electric Corporation, Inc.; and, based on their recommendations, the following actions were taken and the potential cause determined.

Action Taken: The TSP was reset and returned to service. Dranetz line monitors were connected to all four protection sets on Units 1 and 2 to monitor line to ground disturbances. Main control room and switchyard logs were reviewed for similarities, but none were found. TSP and LCP status sheets were developed for maintenance planners such that "as found" board conditions can be recorded before reset. New direct current line monitors are being sent by Westinghouse to measure TSP supply voltage.

Cause: The reason for the lock-up is presently unknown. Westinghouse is pursuing the problem in Pittsburgh, but has not seen any similarities on the Eagle 21 prototype. Westinghouse is evaluating whether a ground-mat or power-spike irregularity is potentially the problem. Westinghouse is pursuing a possible anomaly in the Revision 2 Intel microprocessor board 80286, which caused lock-ups in another application. Westinghouse is building a test circuit for their prototype in Pittsburgh that will accelerate the lock-up of the processor thereby linking the TSP and LCP lock-ups to the previously identified Intel problem.

During this same period, one LCP lock-up occurred on November 30, 1990, in Rack 10. This event caused all channels in Rack 10 to trip and become inoperable. A half-trip condition was created for many reactor protection and emergency safeguard function features without an actual trip condition present. The LCP and TSP were reset and all channels were returned to service. This event may have been caused by similar conditions that created the TSP lock-ups described earlier. For this reason, the same actions were taken and the same possible cause was determined as described for the TSP lock-ups above.

Two other problems were identified with the Eagle 21 system during this period and are described below:

1. Failure: Eagle analog test points on the front test panel are susceptible to channel spikes because of test equipment installation. This was identified on December 5, 1990, when several channel trips occurred during hookup of a digital voltmeter (DVM).

   Action Taken: Caution instructions were issued to planners to be placed in all Eagle 21 troubleshooting work requests. A maintenance management directive that identified and described the problem was issued to instrument mechanics. Westinghouse was notified to assist in the corrective action. Condition Adverse to Quality Report SQP 900479 was issued to document and track corrective action.

   Cause: DVMs have filters in the form of capacitors on their input circuits. When the capacitors charge in the meter, the Eagle input voltage is momentarily decreased (i.e., spike). Westinghouse has simulated the event on the prototype in Pittsburgh, but has not yet identified a long-term hardware fix.

2. Failure: Eagle analog input (EAI) board failure on December 9, 1990, caused containment pressure, refueling water storage tank level, and containment sump level channels to cycle from zero to full scale.

   Action Taken: The EAI board was replaced. Channel functional tests were performed on each affected channel, and each affected channel was subsequently returned to service.

   Cause: The cause of the board failure is presently unknown. The board was shipped to Westinghouse on December 14, 1990, for failure analysis and warranty repair.