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JAN 18 1991

U.S. Nuclear Regulatory Commission
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Washington, D.C. 20555

Gentlemen:

In the Matter of) Docket No. 50-327
Tennessee Valley Authority)

SEQUOYAH NUCLEAR PLANT (SQN) - UNIT 1 - EAGLE 21 SIX-MONTH REPORT

Reference: TVA letter to NRC dated May 10, 1990, "Sequoyah Nuclear Plant (SQN) - Eagle 21 Functional Upgrade Commitments"

In the referenced letter, TVA committed to submit periodic reports at approximately six-month intervals describing design hardware, design software, and maintenance problems with Eagle 21 during Unit 1 Cycle 5 operation. The information in the enclosure is provided to satisfy the first of three reports to meet this commitment. This report covers the period of June 17, 1990, (Unit 1 at 100 percent power) to December 16, 199

During a May 21, 1990, telecon with NRC, TVA also agreed to provide NRC with a summary of TVA's review of technical specification (TS) changes to the original Eagle 21 TS submittal. This summary will be provided under a separate cover letter.

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

Very truly yours,

TENNESSEE VALLEY AUTHORITY

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Enclosure
cc: See page 2

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U.S. Nuclear Regulatory Commission

JAN 18 1991

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ENCLOSURE

SQN Eagle 21, Unit 1 Six-Month Report
Period June 17 through December 16, 1990

Equipment/System Failures

During the period of June 17 through December 16, 1990, the following problems occurred.

Failure 1

The test sequencer processor (TSP) failed five times on the following racks.

RACK	DATE
1-R-13	6/24/90
1-R-3	7/17/90
1-R-7	9/1/90
1-R-7	10/22/90
1-R-8	10/25/90

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. The rack diagnostic lights indicate that the TSP has stopped functioning. The loop calculation processor (LCP) remained operable.

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. Westinghouse Electric Corporation, and Intel Corporation are preparing to update Sequoyah's racks with Revision 3 Intel processors.

Cause:
Westinghouse is evaluating whether a ground-mat or power-spike irregularity is potentially the problem. Westinghouse is also pursuing a possible anomaly in the Revision 2 Intel Microprocessor Board 80286, which caused lock-ups in another application. Westinghouse has built a test circuit for their prototype in Pittsburgh that has caused lock-up of the processor, thereby linking the TSP and LCP lock-ups to the previously identified Intel problem.

Failure 2

During this same period, one LCP lock-up occurred on August 26, 1990, in Rack 5. This event caused all channels in Rack 5 to trip and become inoperable. A half-trip condition was created for several reactor protection and engineered safety features (ESF) without an actual trip condition present. The LCP and TSP were reset and all channels were returned to service, however, as a precaution, the LCP was replaced and returned to Westinghouse for diagnostic evaluation. This LCP board has operated in Westinghouse's test bed in Pittsburg, Pennsylvania without any failures. 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 is considered applicable as described for the TSP lock-ups above.

Failure 3

The 12-volt power supply failed low (0-volt direct current) and caused a TSP failure. The LCP did not fail and the rack remained operable.

The power supply was replaced and the TSP was reset to return the TSP to service. The power supply was returned to Westinghouse for analysis and repair. As of this date, the cause of failure has not been determined. This is the first failure of a power supply and is considered an isolated case. Further actions will be pursued as necessary based on the Westinghouse failure analysis.

Failure 4

Two surveillance injection response (SIR) bus cables failed during this period. The failures occurred during surveillance test mode activities. The failures would not allow the test signal injection to be performed, associated with surveillance test only. The LCP was unaffected by the failures, and all Eagle safety functions remained operable.

The SIR bus cables were replaced and the surveillance testing was satisfactorily completed. Westinghouse has evaluated the failures, reviewed their manufacturing process, and determined the failures are not generic.

Failure 5

A high-temperature cabinet alarm for 1-R-5 was received in the main control room. The LCP remained operable, and all Eagle functions were maintained for reactor protection and ESF considerations.

Actions were taken to determine the rack temperature and it was verified to be normal. Troubleshooting revealed two pins in connector J2 were not fully inserted. The pins were properly installed and the alarm was cleared. This is the first identification of pins that were not properly inserted during onsite installation by the vendor. This is considered an isolated case with no further corrective actions at this time.

Failure 6

An Eagle partial trip (EPT) board failure occurred in 1-R-10. One channel of the board failed causing the delta T turbine runback alarm to annunciate. This condition only caused an alarm function, and all other Eagle functions were maintained.

The EPT board was replaced to resolve the erroneous alarm condition. The board was returned to Westinghouse for analysis and warranty repair. The results of this analysis will be evaluated to determine any further corrective actions that are necessary.

It should be noted that of the failures described above, only the one LCP lock-up disabled any safety functions of the Eagle 21 system. All other failures affected only diagnostic functions or initiated alarm functions without affecting any vital operations of Eagle 21.

Generic Concern

It was determined that channel trip functions can be actuated when a digital voltmeter is plugged into an analog test point in a protection set. This is a generic concern with the Eagle 21 equipment. This has only occurred once at Sequoyah on a Unit 2 Eagle 21 rack during troubleshooting activities but has the potential for occuring on any rack.

Plugging a digital voltmeter (DVM) into the analog input test points on the Eagle 21 racks may cause an input signal perturbation because of the capacitance of the DVM. The DVM must charge or discharge to the input signal voltage level. The magnitude of the perturbation is dependent on the difference between the initial DVM voltage and the input signal voltage. The effect is transient and does not cause signal perturbation. The method for simulating this occurrence was to short the DVM leads to discharge the meter input before inserting the leads into the test point. Unplugging and reinserting the meter did not cause any perturbation since the meter was charged to the input signal voltage level. Tests were performed by Westinghouse with a John Fluke Manufacturing Incorporated Model 8840A DVM to support the above identified apparent cause.

Long-term corrective actions are currently under evaluation and will be tracked under Sequoyah Condition Adverse to Quality Report (CAQR) SQP900479. Review for generic applicability will also be performed under this CAQR. Interim corrective actions required notifying maintenance of the potential problem by issuing a maintenance management directive and supplying maintenance planners with a caution statement that is to be included in all Eagle 21 troubleshooting work activities. Caution tags were also installed on the racks.

Additional Design Concern

Westinghouse discovered the maximum design temperature on an integrated circuit is less than the maximum allowable cabinet temperature. The circuit involves Burr-Brown direct-current to direct-current converter that was environmentally qualified by Westinghouse. This circuit is used on three boards in each Eagle rack.

This problem is being documented and resolved by the CAQR process (CAQR SQP901522). A justification for continued operation (JCO) has been written to address the acceptability of operation with the temperature concern based on compensatory measures to be taken in the event of an Appendix R fire resulting in loss of heating, venting, and air-conditioning cooling to the auxiliary instrument room. These components will be replaced by Westinghouse during the Unit 1 Cycle 5 refueling outage, and Westinghouse has filed a 10 CFR Part 21 to notify its customers of this condition. The Unit 2 direct-current to direct-current converters in question have already been replaced prior to the Cycle 5 start-up.