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MAY 21 1984

Dr. Thomas E. Murley
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, PA 19406

SUSQUEHANNA STEAM ELECTRIC STATION
FINAL REPORT ON A DEFICIENCY INVOLVING
THE REACTOR MODE SWITCH
ER 100508 FILE 821-10
PLA-2189 Docket No. 50-388

References: (1) PLA-1605 dated 4/5/83
(2) PLA-1652 dated 5/6/83
(3) PLA-1690 dated 5/26/83
(4) PLA-1693 dated 5/27/83
(5) IE Information Notice 83-42
(6) PLA-1872 dated 9/30/83
(7) PLA-2026 dated 1/12/84

Dear Dr. Murley:

This letter serves to provide the Commission with a final report on a deficiency involving the SSES Unit 2 Reactor Mode Switch. This deficiency was reported under 10CFR50.55(e) as potentially reportable by telephone to Mr. D. Johnson of NRC Region I by Mr. J. Saranga of PP&L on April 7, 1983.

A description of this deficiency and its safety impact were provided under Reference (6). This letter details our final actions on this issue and provides the Franklin Institute Research Lab evaluation/report on the current mode switch design.

Since the details of this report provide information relevant to the reporting requirements of 10CFR21 for Unit 2, this correspondence is considered to also discharge any formal responsibility PP&L may have for reporting in compliance thereto.

We trust the Commission will find this report to be satisfactory.

Very truly yours,

N. W. Curtis
Vice President-Engineering & Construction-Nuclear

Attachment

IE27

Copy to:
Mr. Richard C. DeYoung (15)
Director-Office of Inspection & Enforcement
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Mr. G. McDonald, Director
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Records Center
Institute of Nuclear Power Operations
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SUBJECT

Final report on deficiencies originally detected in the Unit 1 Reactor Mode Switch.

CORRECTIVE ACTIONS UPDATE

In Reference (7), PP&L reported that after several modifications were made to the original mode switch design by GE, testing was proceeding on the switch. A description of the test procedures used by Franklin Institute Research Lab (FIRL) is included in Section 5 of their final report. At the time of the last report, the final GE switch design had satisfactorily passed receipt inspection and initial functional testing. At this time, the final switch design has satisfactorily completed all testing. During the testing a few anomalies were detected and these are discussed below.

TEST RESULTS ANALYSIS

The anomalies identified during testing were examined and determined to be infrequent random occurrences of a single type of event, not substantially affecting performance and not a sign of a design deficiency. After examination of the anomalies and their possible affect on SSES, it was determined that the anomalies pose no safety hazard.

If the type of random anomaly observed (i.e. a contact remaining open when it should close) were to occur when going to any position other than shutdown it would immediately result in a half scram. This is a system action in the safe direction that would be annunciated and be immediately obvious to the operator, with corrective action prescribed by present operating procedures. This event, by itself, would not affect safe operation. A second independent event affecting RPS would be required to initiate a scram.

In going to the shutdown position, the failure of contacts to close would not prevent a scram from occurring. If a single contact failed to close in going to shutdown the other safety related functions (i.e. MSIV Closure Trip Bypass, Shutdown Scram Reset Interlock, Steam Line Low Pressure Bypass, CRD Scram Discharge Volume High Water Level Bypass) would not be affected because three of the four RPS channels are not affected and therefore system level action is not affected. If in going to shutdown multiple failures of contacts to close were to occur the scram function still would not be affected. The bypasses listed above would be affected, but this does not represent a plant safety concern. The purpose of the scram reset interlock (listed above) is to eliminate a sustained scram signal when the scram is caused by placing the mode switch in shutdown. The system affect of multiple contact failures, as it relates to the reset interlock, is equivalent to the continuing presence of an automatic scram signal (e.g. low RPV water level) and; therefore, is not considered a safety concern.

FIRL RECOMMENDED CORRECTIVE ACTIONS

In their final report, FIRL made several recommendations (see Section 8). The following are the FIRL recommendations with the associated PP&L actions.

(1) FIRL recommended that the switch life be limited to 1000 cycles. PP&L agrees with this recommendation and will limit the switch life to less than 1000 cycles by limiting it to a 20 year life. We believe 1000 cycles

in 20 years is a conservative number. Given the cyclic values in Technical Specification Table 5.7.1-1 a switch installed after pre-op testing can be expected to see much less than 1000 cycles during the 20 year life of the switch.

(2) FIRL recommended that the manufacturer be requested to take extra care in removing extraneous plastic particles from the switch segments during assembly. The PP&L representative present during disassembly observed that the amount of extraneous material found in the test switch to be minimal and consistent with good manufacturing techniques and therefore any additional effort would be of limited benefit. However, PP&L does consider continued cleanliness in the area of the switch to be important. Housekeeping and cleanliness are maintained in accordance with plant procedure AD-QA-503.

(3) FIRL has also recommended that the key be removed after each change in switch position to avoid stopping the switch in a false detent. PP&L believes that this removal represents a potential wear or degradation mechanism that has not been tested. In place of the key removal and to monitor the performance of the switch PP&L will develop a program of dynamic (make before break) testing of the switch. This testing will be performed once every refueling outage. PP&L believes this is sufficient to detect any trends towards a false detent because the number of cycles the switch will see between refueling outages should be small.

STATUS OF SSES SWITCHES

The Unit 2 mode switch has been replaced by one identical to the type that passed testing at FIRL. After the switch was installed, static (contact verification) and dynamic (make before break) tests were performed to verify switch operation. The switch passed these tests satisfactorily. This switch will be tested statically and dynamically once every refueling outage to detect any signs of wear. This is the only restriction placed on the switch.

The Unit 1 mode switch has not yet been replaced. When a convenient opportunity presents itself, this mode switch will be replaced with a switch identical to the type that passed testing at FIRL. Until the switch is replaced, existing operating restrictions will remain in place on the Unit 1 mode switch. After replacement, all restrictions (other than the once per fuel cycle tests described above for the Unit 2 switch) will be removed.

CONCLUSION

The original mode switch design had several deficiencies including significant irregularities which were found on the cam shaft parts. Inherently large design clearances contributed to imprecise operation of the cam followers and the general construction of the switch allowed nonuniform rotation of the cam shaft. These deficiencies never compromised the safe operation of Susquehanna; but it is feasible that the discrepancies, had they gone uncorrected or unaccounted for (via procedural checks, periodic testing, etc.), could have eventually adversely affected the safety of operations. Consequently, PP&L considers this deficiency reportable under 10CFR50.55(e).

The present mode switch design is a significant improvement over the original mode switch design. The following design enhancements have been made:

(1) cam follower surfaces were rounded
(2) like cams were made more uniform and were color coded
(3) an "O" was placed on the reverse side of all cams to assure proper installation
(4) a steel torsion/bar shaft was added to reduce angular play
(5) the design and manufacturing tolerances were reduced
(6) the external contacts were fixed with epoxy
(7) strain relief was added to external wiring of the switch
(8) cam surfaces were milled

These modifications have resulted in a substantial improvement in mode switch operation and performance. The anomalies discovered during testing are not a safety concern. The impact of any degradation due to wear will be avoided by limiting the switch to a conservative useful service life of 20 years. Periodic testing at each refueling outage will detect any significant degradation in performance. As a result of the above, PP&L feels confident that the final redesigned GE mode switch will operate as required.