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KANE,W.F. Region 1, Ofc of the Director

SUBJECT: Submits status of actions w/respect to creation of clear design basis for temp based room leak detection sys.

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JAN 16 1990

Mr. William F. Kane, Director
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50.9 REPORT

SUSQUEHANNA STEAM ELECTRIC STATION
STATUS/UPDATE ON DELTA T ACTIONS
PLA-3315 FILES R41-1C, R41-2

Docket Nos. 50-387
and 50-388

Dear Mr. Kane:

The purpose of this letter is to status our actions with respect to creation of a clear design basis for temperature based room leak detection systems, and to notify NRC of our intent to submit a Technical Specification change to eliminate delta-T instrumentation isolation requirements from the Technical Specifications. Per our discussion with your staff on December 19, 1989, PP&L is submitting this letter pursuant to 10CFR50.9.

On July 27, 1988, PP&L identified that all four Main Steam Tunnel delta-T modules in both units were inoperable in that the temperature element locations were reversed. Upon notification on July 27, 1988, NRC initiated a review of the issue (NRC Inspection Report 50-387/88-15 and 50-388/88-18 dated 8/18/88) and held an Enforcement Conference on September 9, 1988 (Enforcement Action 88-226). Subsequent to the enforcement conference NRC issued PP&L a Level IV violation (Notice of Violation (NOV) for NRC Inspection Report 50-387/88-15 and 50-388/88-18 dated 9/30/89).

Previous Status Report:

PLA-3214 dated 7/24/89 provided a status report of PP&L actions in response to the NOV. One activity reported was the analyses of the thermal response of the rooms with temperature based leak detection capabilities using the Compartment Transient Temperature Analysis Program (COTTAP) as part of our activities to establish the design bases for the leak detection instrument setpoints. It was also reported that several concerns had arisen from the HPCI room thermal analysis. The calculations showed that with existing setpoints, room thermal increases resulting from steam leaks of 5 gpm would not produce an isolation trip within a reasonable time

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period. It was also reported that redefinition of the setpoints to allow earlier detection and isolation of 5 gpm leak rates would result in a higher probability of undesired isolations due to abnormal but not unexpected temperature perturbations. These contradictions justified redefinition of the assumed leak rate used for setpoint calculations.

PLA-3214 also reported that PP&L was planning to continue these analyses for all rooms containing temperature based leak detection circuitry, and would establish these design bases by the end of the first quarter of 1990.

Setpoint Design Bases Issues:

Calculations completed to date using leak rates of 25 gpm showed that present setpoints for steam line isolation are satisfactory, and would result in early detection and isolation, ensuring the desired safety function. Judgments on what constituted an appropriate design bases leak for setpoints considered two criteria contained in FSAR Section 5.2.5.1.3: the system must provide timely detection of a leak; and that sufficient margin must be provided above maximum post LOCA area temperatures to preclude unnecessary isolation of the ECCS system (or non ECCS reactor auxiliary system) when needed.

Additionally, the NSSS vendor was contracted to provide an analysis of their design bases for the leak detection system. Their report, EDE-17-0689, dated June 1989, recommended that setpoints be chosen to provide an alarm at leak rates of 5 gpm, and that isolation actuation occur at leak rates of 25 gpm. It was reported that 25 gpm leaks serve as the design bases for isolation purposes for other BWR licensees.

Room Pressurization

Following HPCI room modeling, PP&L modeled the thermal effects of steam leaks in the RCIC room. The results and conclusions drawn were similar with respect to the design bases issues for setpoint selection. Subsequently, RCIC room pressurization calculations using 5 gpm and 25 gpm under steam leak conditions was modeled using the COTTAP code. Initial modeling indicated a pressure transient that rose rapidly past the setpoint of the Back Draft Isolation Dampers (BDIDs) resulting in BDID closure. BDIDs are used to protect redundant divisions of electrical and mechanical equipment from the effects of a high-energy pipe break outside of the primary containment which may have disabled equipment of the division in the area of the pipe break. BDID closure would render the delta-T instruments inoperable in that the cold leg of the

instrument would measure the same temperature as the hot leg, driving measured delta-T toward zero. This model conservatively assessed instrument operability under leakage conditions. It accomplished this by treating leakage from the RCIC room in a conservative manner, which resulted in a bounding condition for rate of pressure rise.

In the interest of prompt reporting, we notified the NRC of this condition on October 18,1989. NRC granted PP&L verbal enforcement discretion regarding Steam Leak Detection delta-T instruments on October 18, 1989. NRC letter dated October 19, 1989 confirmed the verbal enforcement discretion granted on October 18, 1989. On October 20, 1989, PP&L submitted an emergency Technical Specification change request for relief from the provisions of Specification 3.2.2 regarding delta-T instrumentation. NRC confirmation of this request was received on October 20, 1989. A three month temporary change was approved to allow PP&L sufficient time to develop corrective actions, to submit a request for a permanent change, and for the NRC to review and approve the request.

Following this activity, additional modeling was performed for the RCIC room to determine the sensitivity of room pressure rises to more realistic leakage conditions from the room as would be expected for pressure relief through the HVAC ductwork prior to BDID closure. Industry standard ductwork pressure drop versus flow correlations were used. These calculations concluded that only small pressure increases in the room with the steam leak could be expected for any leakage up to 25 gpm, insufficient to reach the BDID setpoints.

However, we found the room pressure rise for a leak size of 25 gpm would be sufficient to cause a flow reversal in the RCIC room HVAC supply duct. The back flow from the RCIC room would be discharged to adjacent rooms on the same HVAC header.

Results from the 5 gpm leak case RCIC room pressure rise study show that room pressurization would not be adequate to cause a flow reversal, thus confirming delta-T instrument operability for this size leak. It can be postulated that RCIC delta-T instruments would function properly for most leaks, and may only be subjected to reversed inlet duct flow for the largest size leaks. Thus, the initial motivation for our request for Technical Specification changes (BDID closure) is no longer accurate, although the forcing parameter, room pressurization under large leak conditions, remains a potential threat to the proper functioning of the steam leak detector delta-T instrument circuits. Pressure transient calculations will be performed for the HPCI room.

In the modeling for any room, the effect of the leak on room pressurization is determined by the size of the leak, the size of the room, and the amount of HVAC air circulated through the room. The presence or absence of room heat sinks or sources also impacts the final results. For example, we would expect that a 25 gpm leak in the Reactor Building Main Steam Tunnel would not result in any increase in room pressure (due to the large volume involved).

Because of the many variables affecting room pressurization and the potential significance of room pressurization for delta-T leak detection systems, PP&L has contracted for independent outside calculation of room pressure response in the HPCI and RCIC areas under steam leak conditions. These results will be used to further validate the PP&L calculational models.

Proposed Permanent Technical Specification Changes

PP&L is preparing a Technical Specification change request for the removal of the isolation functions of the delta-T instrumentation circuits. This Technical Specification change request will be based upon four points:

1. Delta-T based isolation functions are unnecessary design features whose failure could contribute to inadvertent isolation of safety systems. In every instance in which they are used, a divisionalized redundant high ambient temperature based isolation function is provided. In addition, other redundant and diverse instruments are provided that will also detect leakage or line break conditions and result in isolation.

2. In all leakage conditions, a range of instrument signals would result in main control room alarms that would alert the operator to the situation, and result in his taking action to resolve the problem.

3. The program established by PP&L to provide an analytical basis for the nominal design bases leakage condition that would result in isolation has determined that for at least one condition (25 gpm leak in the RCIC room), the delta-T instruments may not be reliable.

4. Delta-T instrument is a poor choice for an ECCS isolation function due to the affect on the non-accident, non-leakage delta-T value caused by daily and seasonal fluctuations in the temperature of the HVAC incoming cold air. This results in either excessive or inadequate margin existing at various times between the isolation

trip point and the room's operating differential temperature. The delta-T monitoring function is also subject to interruptions under loss of Reactor Building HVAC conditions, initiation of Reactor Building Recirculation System, and HELB conditions.

PP&L has determined that the removal of the delta-T instrumentation from Technical Specification's does not increase the probability of occurrence or the consequences of an accident or malfunction of equipment related to safety, as previously evaluated in the FSAR.

In summary, based on revised information, PP&L now concludes that the delta-T instrumentation in rooms with BDID's are operable and no longer need a permanent Technical Specification change based on our emergency submittal of October 19, 1989. Delta-T instrumentation in the RCIC room may become unreliable due to room pressurization because of backflow through the HVAC supply ducts. A new Technical Specification change to eliminate all delta-T instrument isolation requirements from the current Technical Specifications will be submitted. We expect to submit the new change during the first quarter 1990, and base it on the justification noted above. Revisions to the FSAR will also be made in conjunction with the Technical Specification change to reflect our revised design.

As PP&L completes the analytical design basis program, additional changes to the FSAR and to the Technical Specifications are expected. These changes are in addition to the proposed Technical Specification change to remove the delta-T instrumentation isolation function. The analytical design basis program will be completed by the end of the second quarter of 1990 instead of by the end of the first quarter of 1990 as originally stated in PLA-3214.

Please contact C.T. Coddington (215-770-7915) if you have any questions concerning this letter.

Very truly yours,

H. W. Keiser

H. W. Keiser

cc: NRC Document Control Desk (original)
NRC Region I
Mr. M.C. Thadani - NRC Project Manager
Mr. G.S. Barber - NRC Sr. Resident