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Gentlemen:

10 CFR 50, APPENDIX R INSPECTION
SPURIOUS VALVE ACTUATION ISSUE
SALEM GENERATING STATION UNITS 1 AND 2
DOCKET NOS. 50-272 AND 50-311

During the Salem Appendix R Inspection, conducted from May 17, through May 21, 1993, an unresolved issue was raised pertaining to Salem's interpretation of NRC Generic Letter 86-10 guidance regarding spurious valve actuation. During an inspection-related teleconference on June 3, 1993, NRC requested that PSE&G provide a written response describing our position with respect to those guidelines.

In response to that request, PSE&G hereby provides, in Attachment 1 to this letter, a description of our position on spurious valve operation during an Appendix R fire - including the methodology used and specific guidance cited from Generic Letter 86-10.

Should you have further questions on this matter, we will be pleased to discuss them with you.

Sincerely,

Attachment

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ATTACHMENT 1

The post-fire safe shutdown analysis performed for Salem used a methodology that addressed components (valves) in two categories. (1) Components whose operation was required for system performance were identified and classified as either "HSB" or "CSD". HSB represents a component whose operation was required to achieve and maintain **Hot Standby**. CSD represents a component whose operation was only required to achieve and maintain **Cold Shutdown**. (2) Components whose spurious (fire-induced) operation would prevent system success were identified and classified as "SOE" (spurious operation equipment). For example, a normally closed motor-operated valve that, if spuriously (fire-induced) opened, would divert process flow was classified as SOE. Similarly, a normally open motor-operated valve that, if spuriously closed, would block process flow was classified as SOE. Manual valves and check valves were not considered for spurious operation, in that fires would not result in these valves changing position.

These components (HSB's, CSD's, and SOE's) were then integrated into a shutdown model, which is basically a success tree of shutdown functions, systems, and components. Using the shutdown model, an assessment was performed for each fire area of the plant. The treatment of the SOE components was based on the guidelines provided in Generic Letter (GL) 86-10, Questions and Answers Section 5, "Alternative and Dedicated Shutdown Capability".

For each fire area, it was initially assumed that if an SOE component's cables were located in that area and were unprotected, the component would spuriously operate. This assumption was based on a conservative application of GL 86- 10 Section 5.3.1, "Circuit Failure Modes" which states, in part, that:

> "... Sections III.G.2 and III.L.7 of Appendix R define the circuit failure modes as hot shorts, open circuits, and shorts to ground. For consideration of spurious actuation, all possible functional failure states must be evaluated, that is, the component could be energized or de-energized by one or more of the above failure modes. Therefore, valves could fail open or closed..."

The assumptions used at this stage were conservative in that all SOE components were assumed to spuriously operate regardless of the actual cabling in the fire area.

If a success path (one train of safe shutdown systems) was not available due to the spurious operation of these SOE components, the assessment was refined. At this point, the actual cabling in the fire area was evaluated with respect to the ability of fire-induced failures to result in spurious actuation of components. For example, if the cabling in the area only provided an indication function, it would be physically impossible for a fire affecting that cabling to cause spurious actuation. The cable failure modes considered included hot shorts, open circuits, and shorts to ground. Failure of the power cables to any motor operator from a Motor Control Center would also not result in spurious actuation of motor-operated valves per GL 86-10, Section 5.3.1. The assumptions used at this stage were also conservative in that, based on the actual cabling in the fire area, all of the components were assumed to spuriously operate, if physically possible.

Again, if a success path (one train of shutdown systems) was not available due to the spurious operation of SOE components, the assessment was further refined. At this juncture, it could no longer be assumed that all of the SOE components with cabling in the fire area would spuriously actuate. GL 86-10 Section 5.3.10, "Design Bases Transient" was applied to define the number of spurious actuations that needed to be considered for each fire area. This section states, in part, that:

"a. The safe shutdown capability should not be adversely affected by any one spurious actuation or signal resulting from a fire in any plant area; and

b. The safe shutdown capability should not be adversely affected by a fire in any plant area which results in the loss of all automatic functions (signals, logic) from the circuits located in the area in conjunction with the worst case spurious actuation or signal resulting from the fire; and

c. The safe shutdown capability should not be adversely affected by a fire in any plant area which results in spurious actuation of the redundant valves in any one high-low pressure interface line."

These three conditions were conservatively applied to the SOE components, as described herein.

If the unprotected cabling of redundant SOE components was located within a fire area, the impact of fire-induced spurious actuation of each component was evaluated. The cable fire damage was not assumed to be limited to one hot short but, one spurious actuation of the component was considered regardless of the type of cable damage. PSE&G applied the number of spurious actuations defined by Section 5.3.10. Thus, regardless of which one of the redundant SOE components spuriously actuated, a safe shutdown path was assured.

Fire-induced actuation of components was also evaluated in conjunction with the operation of other equipment; for example, the charging pump suction valves from the volume control tank - it was assured that spurious actuation of these valves would not lead to pump damage due to loss of suction flow. (Note: this concern only applies to the two centrifugal pumps and not to the positive displacement pump). The cables for these suction valves are located in various plant fire areas. For the alternate shutdown areas, the ability to use any of the three charging pumps is provided. For the remaining areas, separation and protection ensures post-fire availability of at least two charging pumps. Therefore, for all plant fire areas, should a spurious actuation occur, a charging pump would be available.

For cases of high-low pressure interfaces, it was assumed that redundant valves in any one line would spuriously actuate. Thus, all sets of high-low pressure interfaces were evaluated and appropriately protected.

For devices associated with the Safeguards and Solid State Protection Signal functions, spurious actuations were addressed only for the output signals. These logic protection functions receive multiple inputs signals and provide

multiple output signals. For example, a logic function may require two of three inputs in order to initiate closure of several isolation valves. Failure of any one input signal, per the GL 86-10 guidance, would not satisfy the input logic and cause a spurious actuation. Therefore, failures of the input signals were not specifically addressed. Failures of the output signals were addressed individually as described previously. Failure of the logic function cabinets, themselves, which could cause loss of all automatic functions from that cabinet, in addition to one spurious actuation, was addressed as part of the alternate shutdown capability (which provides for alignment of any valve which may have spuriously operated).

In conclusion, PSE&G is confident that the approach taken in Salem's Safe Shutdown Analysis for spurious actuation is consistent with the guidelines of Generic Letter 86-10. The analysis demonstrates that fire-induced spurious operation of any component would not adversely affect the ability to achieve and maintain safe shutdown.