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Gentlemen,

RESPONSE TO NRC LETTER DATED JANUARY 25, 1996
10CFR50 APPENDIX R SAFE SHUTDOWN CAPABILITY
SALEM GENERATING STATION UNITS 1 AND 2
FACILITY OPERATING LICENSE NO. DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311

Public Service Electric and Gas Company (PSE&G) hereby responds to NRC letter, "Safe Shutdown Capability Reassessment for Salem Nuclear Generating Station, Units 1 and 2," dated January 25, 1996 and its enclosed Technical Evaluation Report (TER). The TER reviewed PSE&G's responses to NRC concerns regarding the Salem alternate shutdown methodology and analysis for fire-induced spurious operation of equipment.

This letter provides PSE&G's perspective on the current status of TER issues regarding Salem's Appendix R safe shutdown capability based on a February 7, 1996, meeting held between NRC and PSE&G to discuss those issues. At the meeting, PSE&G made presentations on (1) Alternate Shutdown Capability and the use of repairs to achieve hot shutdown, (2) Information Notice 92-18, and (3) Fire Induced Spurious Operation. During the presentations, PSE&G also described design changes being implemented at Salem.

During the meeting, PSE&G stated that Salem has initiated, as a plant improvement to eliminate potential "operator workarounds," a design change installing transfer switches which eliminate the use of jumpers as a method for achieving post-fire hot standby conditions. PSE&G indicated that the design input for the change considered NRC documents such as Generic Letter 81-12 and 86-10. This design change is expected to be complete by the end of June, 1996.

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The PSE&G presentation also described a design change to reinstall motor operated valve (MOV) thermal overloads. The NRC, at the meeting, agreed this modification would eliminate the concerns of Information Notice 92-18 for Salem. This design change has been installed.

The Salem Safe Shutdown Analysis assumed all combinations of any one spurious actuation in conjunction with multiple failures involving loss of all automatic functions in all plant areas. As discussed at the meeting, PSE&G re-reviewed the analysis for every fire area where the single spurious actuation criteria was applied. It was found, for all such applications, that dependence on the single spurious actuation criteria was not necessary because the cabling in each application either met separation requirements, was protected, or its function for the component(s) it served would not lead to spurious operation. PSE&G believes that this evaluation resolves the fire-induced spurious operation issue for all fire areas other than alternate shutdown areas.

Only one issue was raised during the meeting that is perceived as requiring further PSE&G review. That issue is associated with interpretation of the guidance of Generic Letter 86-10 for fire-induced spurious operation as it applies to alternate safe shutdown fire areas. During the meeting, the NRC indicated that the scope of the installation of transfer switches should have considered the effects of multiple spurious actuations in alternate safe shutdown fire areas. PSE&G believes that the guidance of Generic Letter 86-10, Question 5.3.10, regarding the number of spurious actuations that must be considered for these areas, was correctly interpreted and implemented by PSE&G and that imposition of any new design requirements based upon the NRC's interpretation put forth at the meeting, which is different from previous staff guidance provided in Generic Letter 86-10, Question 5.3.10, is outside Salem's current Appendix R licensing bases.

The above notwithstanding, PSE&G has performed a review of systems necessary to achieve and maintain Hot Standby conditions to determine if the fire-induced spurious actuation of redundant components was a concern. Of those systems necessary to achieve and maintain hot standby, only the Service Water System was found to be potentially vulnerable under the new NRC interpretation.

The following Service Water valves are impacted in Salem Unit 2:

21SW21 and 22SW21 - Diesel Generator Cooling Water Supply
21SW22 and 22SW22 - Nuclear Header Isolation
22SW20 and 24SW20 - Header Isolation
21SW23 and 22SW23 - Header Crossover

As a plant improvement which will streamline operation of these valves for post-fire safe shutdown, PSE&G has developed a conceptual modification similar to, but more complex than, the previously mentioned design change which installed transfer switches. PSE&G currently projects the costs involved to provide transfer switches for the above valves for both Salem Units at $1.08 million. Alternate versions of this modification are presently being evaluated.

In an effort to provide closure and to reduce the work load on the plant operating staff during a postulated fire event, PSE&G currently plans to implement a design change no later than by the end of the next refueling outage of Salem Unit 2. The date for implementation on Salem Unit 1 is not known at this time. PSE&G believes that the above proposed modification provides resolution for the February 7, 1996, meeting item remaining.

PSE&G anticipates that our completed, in-progress, and proposed plant improvements provide a basis for a final resolution of NRC concerns on the issues and for finding the Salem plants in compliance with 10CFR50, Appendix R, Sections III.G and III.L.

PSE&G's specific responses to the Technical Evaluation Report are provided in Attachment 1.

Should you have any questions, we will be pleased to discuss them with you.

Sincerely,

Mark E. Gray
for ECS

Attachment (1)

C Mr. T. Martin, Administrator - Region I
U. S. Nuclear Regulatory Commission

Mr. L. Olshan, Licensing Senior Project Manager
U. S. Nuclear Regulatory Commission

Mr. C. Marschall (X24)
USNRC Senior Resident Inspector

Mr. K. Tosch, Manager IV
NJ Department of Environmental Protection
Bureau of Nuclear Engineering

RESPONSES TO STATEMENTS IN TECHNICAL EVALUATION REPORT (TER) TRANSMITTED BY NRC LETTER DATED JANUARY 25, 1996

Section 1, Background and Section 4.2, page 11
The TER states that "The Alternate Shutdown methodology was found to rely on the use of repair activities (e.g., cutting of electrical leads..."

PSE&G Response
PSE&G's alternate shutdown methodology to effect operation of equipment does not involve cutting leads. Cutting leads was previously employed in an isolated case for Reactor Hot Leg and Cold Leg Temperature indication. This concern was identified as an unresolved item in NRC Inspection Report No. 50-272/83-37 and subsequently corrected via a design change. The item was closed by the NRC in Inspection Report (50-272/89-02 and 50-311/89-02), dated March 20, 1989.

Section 1, Background
In the Review Criteria section, the TER refers to PSE&G as TVA.

Section 5.2.1, p. 16
The TER cites PSE&G's analysis of valves 1CV40, 1CV41, 1SJ1 and 1SJ2 as based solely on the assumption that only one of these sets of valves would spuriously operate based on PSE&G's interpretation of Generic Letter 86-10, Question 5.3.10(a).

PSE&G Response
These valves are not classified as spurious operation equipment (SOE) in PSE&G's analysis. The valves cited (CV40, CV41, SJ1 and SJ2) are required to operate for hot standby to isolate the Volume Control Tank (VCT) and align borated water from the Refueling Water Storage Tank (RWST). Cables for these components are separated or protected to assure safe shutdown. This item was discussed at the February 7, 1996 meeting and PSE&G considers this item closed.

Section 4.3 Conclusion
The TER states "We conclude that Salem is not in compliance with Sections III.G and III.L of Appendix R, and the licensee's alternate shutdown system design, as it currently exists, has never been fully reviewed and approved by NRR."

PSE&G Response

This item is related solely to the use of jumpers and lifting leads. PSE&G believes that the alternate shutdown methodology for the Salem Units has been, and continues to be, in compliance with 10CFR50 Appendix R, Sections III.G.3 and III.L. The NRC also concluded that Salem is in compliance with Section III.G.3 and III.L of Appendix R in its Safety Evaluation Report (SER), dated May 31, 1983.

The following provides a summary of Salem's licensing history regarding the use of jumpers and lifting leads to effect operation of equipment for safe shutdown:

1) On March 19, 1981, PSE&G sent a letter to the NRC discussing compliance with 10CFR50 Appendix R. A portion of this letter states:

   "Repairs within the fire zone are not required. Procedures will direct personnel actions to achieve cold shutdown external to the fire zone. Any repairs which could be made to allow control room operations or additional equipment operability would enhance shutdown capabilities."

   This letter states PSE&G's position that repairs are not required in the fire zone or to restore fire damaged equipment. Repairs may be utilized to enhance shutdown capabilities.

2) Combined Inspection Report 272/81-12 and 311/81-11 states:

   "The inspector examined equipment and facilities necessary to carry out the alternate shutdown procedures. The following aspects of the procedures were found acceptable... all equipment listed in local operating instructions has been prestaged, with most of the equipment being placed in locked cabinets with keys available in the hot shutdown panel."

   The above statement endorsed the use of prestaged equipment as part of the alternate shutdown program.

3) In September 1981, PSE&G submitted the "Safe Shutdown and Interaction Analyses" to the NRC. This submittal included Emergency Equipment Operation procedures directing the operator to perform actions such as installing jumpers, lifting leads, and changing fuses. References to these procedures can be found within the document.

4) An April 20, 1982 letter from the NRC expressed concerns regarding Alternative Safe Shutdown at Salem. This letter

included both requests for additional information and items that the NRC considered to be deficient. A portion of this letter states:

"The licensee's alternate shutdown procedure requires installation of electrical jumpers and pneumatic bypasses. It is our position that systems and components used to achieve and maintain hot standby conditions must be free of fire damage and capable to maintain such conditions for the duration of the hot standby condition. Systems and components used to achieve and maintain cold shutdown should be either free of fire damage or the fire damage to such systems should be limited such that repairs can be made and cold shutdown achieved within 72 hours. Repair procedures for cold shutdown systems must be developed and material for repair maintained onsite. It is our position that electrical or pneumatic jumpers are not a suitable method of repair for cold shutdown."

The above statement allows repairs to achieve cold shutdown - provided that cold shutdown can be achieved within 72 hours, repair procedures are developed, and material for the repairs is maintained onsite.

5) On June 16, 1982, PSE&G responded to the above concern via a supplement to the "Safe Shutdown and Interaction Analyses Report." The response states:

"The alternative shutdown procedures used at Salem do not require the use of electrical jumpers or pneumatic bypasses to achieve hot shutdown conditions. Manual operation of the steam-driven auxiliary feedwater pump, associated valves, and the steam generator relief valves provides hot shutdown capability for approximately 8 hours...After approximately 8 hours, the plant can be maintained in a hot shutdown condition even if spurious operations of equipment occur since the alternate shutdown procedures provide a mechanism to disconnect control circuits from potential fire induced damage at any time during the shutdown if necessary. It should be noted that the term 'electrical jumpers' as used in this response, refers to a hard-wired connection of spade lugs to terminals which is tantamount to a permanent installation until such time as any damaged equipment can be replaced." The response, while discussing valves associated with the shutdown conditions, continues:

"All motor operated valves are equipped with handwheels, but the existing alternate shutdown procedures indicate a preference for the use of electrical jumpers."

This submittal states that Salem can attain hot shutdown without requiring the use of electrical jumpers or pneumatic bypasses. The Alternate Shutdown procedures provide a mechanism to locally control equipment and maintain hot shutdown, even if equipment operates spuriously. It also indicates that Salem considers the use of electrical jumpers o be preferable to the manual use of valve handwheels.

6) In the SER for Salem's Alternate Safe Shutdown Capability, the NRC referenced the "Safe Shutdown and Analyses Report" and additional information obtained from the June 16, 1982 letter and stated:

"The licensee has provided a safe shutdown analysis for a fire event, and has demonstrated that adequate redundancy and/or an alternative safe shutdown method exist for those systems required to assure safe shutdown."

The above statement accepts the June 16, 1982 response to the NRC's concern about the use of repairs. The next sentence, in the same paragraph, states:

"No repairs or modifications are required to effect hot or cold shutdown utilizing the alternate shutdown methods."

PSE&G has interpreted this to refer to repairs to fire-damaged equipment within the fire zone and to exclude the replacement of fuses, the installation of electrical or pneumatic jumpers, and lifting leads. This interpretation is due to the context of the approval of the methodology that was explained in the "Safe Shutdown and Analyses Report" and defended in the June 16, 1982 supplement to the "Safe Shutdown and Analyses Report."

The SER also states:

"The alternate shutdown methods have the capability of achieving cold shutdown within 72 hours after a fire event and no repairs are planned in order to achieve cold shutdown conditions."

Based on a review of the associated documentation (see 4/20/82 and 6/16/82 letters), this statement appears to refer to repairs to fire damaged equipment in the fire zone.

Additionally, the SER states:

"The alternate shutdown method will be accomplished by procedural means, with actions performed at local shutdown

stations or locally at the equipment. The licensee has also provided a summary of the functions for which alternate shutdown methods may be needed, and the manual actions required to accomplish each of the identified functions have been described."

The above statement accepts the described alternate shutdown methods, which include fuse replacement, installation of jumpers, and lifting leads.

7) Inspection Report 272/83-37 documents the review and walk-through of Alternate Shutdown Procedures. The Inspection Report states:

"The scope of review was to ascertain that the alternate shutdown could be attained in a safe and orderly manner, to determine the level of difficulty involved in operating equipment, and to verify that there was no dependence on repairs for achieving hot shutdown. For purpose of the review, a repair would include installing electrical or pneumatic jumpers, wires or fuses to perform an action required for hot shutdown."

This inspection identified that "repairs" were required to locally start a Diesel Generator. Since a diesel is required to maintain hot standby, the NRC found this to be unacceptable. Additionally, the emergency operating procedure for connecting Reactor Hot Leg and Cold Leg Temperature Instrumentation required repairs. This was considered to be unacceptable because the NRC considered this instrumentation to be necessary for hot shutdown. Design Changes have been implemented to correct these issues.

The inspection report also states:

"It was observed that pneumatic jumpers, electrical jumpers, fuse pullers, electrical tape and necessary tools for alternate shutdown are stored in a locked box near the hot shutdown panel area."

An unresolved item was assigned to "include periodic surveillance of the required items to ensure complete inventory."

PSE&G understands this Inspection Report to state that repairs should not be required to attain hot shutdown, but may be used during the Alternate Shutdown process.

8) Combined Inspection Report 272/85-08 and 311/85-09 closed the above Unresolved Item by verifying:

"...that the licensee maintains an inventory of tools necessary for alternate shutdown operations such as fuse pullers, electrical jumpers, etc."

PSE&G understands this as an acknowledgment that repairs are being used and as a concurrence that repairs may be used during the Alternate Shutdown process.

9) Inspection Report 311/87-29 documents a walk-through of portions of the "Control Room Evacuation Due to Fire in the Control Room or Relay Room" procedure. The purpose of this walk-through was to determine by simulation that shutdown from outside the Control Room is possible in an orderly and timely fashion. During this inspection an unresolved item was assigned, stating:

"Some of the operator actions are repairs by NRC definition and, therefore, are not allowed during the hot shutdown phase. The repairs in question involve the use of pneumatic jumpers to prevent spurious actuation of valves. The licensee explained that an alternative to the use of pneumatic jumpers exists in the procedure but using jumpers is the preferred way. The licensee also explained that the NRC has specifically reviewed the use of jumpers and has found it acceptable."

10) The above unresolved item was closed via Combined Inspection Report 272/90-01 and 311/90-01. The inspection report states:

"Documentation was provided confirming NRC review of the post-fire shutdown capability for the Salem facility. An NRC letter to the licensee, dated May 31, 198(3)sic addresses the additional information and clarification obtained in licensee letters to the NRC dated June 16, 1982 and December 22, 1982. The NRC determined that the licensee had demonstrated that adequate redundancy and/or an alternative safe shutdown method exists for those systems required to assure safe shutdown.

Supplemental information was provided by the licensee in the June 1982 safe shutdown and interaction analysis included in enclosure 2 on the use of electrical and pneumatic jumpers in the licensee's alternate shutdown procedures. In addition, the licensee developed a valve list for long-term hot

shutdown and/or preparation for cold shutdown (8 to 72 hours) which identifies the valve procedures indicating a preference for the use of electrical jumpers. The licensee's Procedure 1(2) AOP-EVAC-2 for 'Abnormal Operating Procedures' addresses the use of individual valve procedures as applicable when maintaining the unit in Hot Standby or taking the unit to cold shutdown due to a fire in the control room or a fire in the relay room."

Due to the specific reference to the June 1982 response to the concern raised in the April 20, 1982 letter, PSE&G has interpreted these statements to allow the replacement of fuses, installation of jumpers, and lifting of leads as the preferred method to assure safe shutdown.

The unresolved item raised during NRC inspection 272/93-80 focused on the statements in the 1983 SER. In order to avoid future conflicts due to the varying interpretations of the statement "no repairs or modifications are required to effect hot or cold shutdown utilizing the alternate shutdown methods", it is requested that the SER for Salem's Alternate Safe Shutdown Capability be revised to state that "No repairs or modifications in the fire zone are required to attain hot standby utilizing the alternate shutdown methods."

It is also requested that the phrase "...and no repairs are planned in order to achieve cold shutdown conditions" be deleted from the SER for Salem's Alternate Safe Shutdown Capability.

Section 5.3, Conclusion

The TER notes, "In its response to Question 5.3.1 of Generic Letter 86-10, the NRC signifies the need to consider multiple spurious operations that may occur as a result of fire by stating that 'valves could fail open or closed; pumps could fail running or not running...'."

In the next paragraph, the TER identifies that Question 5.3.10 of GL 86-10 states "The safe shutdown capability should not be adversely affected by any one spurious actuation or signal resulting from a fire in any plant area." The TER states "When viewed in isolation, it would appear that the response provided by the staff supports the licensee's position that only one spurious operation need be considered as a result of fire. However, when both the question and its response are viewed in their entirety and in the context which the question was asked, such an interpretation no longer appears valid."

PSE&G Response

PSE&G does not agree with the TER interpretation of Generic Letter 86-10. Salem's assumptions for spurious operation are based directly on the guidance provided in Generic Letter 86-10, Questions and Answers Section 5, "Alternate and Dedicated Shutdown Capability."

Question 5.3.1, "Circuit Failure Modes" states:

"QUESTION: What circuit failure modes must be considered in identifying associated circuits associated by spurious actuation?"

RESPONSE: "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 actuations, 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; pumps could fail running or not running; electrical distribution breakers could fail open or closed. For three-phase AC circuits, the probability of getting a hot short on all three phases in the proper sequence to cause spurious operation of a motor is considered sufficiently low as to not require evaluation except for any cases involving Hi/Lo pressure interfaces. For ungrounded DC circuits, if it can be shown that only two hot shorts of the proper polarity without grounding could cause spurious operation, no further evaluation is necessary except for any cases involving Hi/Lo pressure interfaces."

PSE&G considered this question as guidance on what types of failure modes must be considered in identifying circuits associated with spurious actuation. It identifies that three-phase AC circuits and ungrounded DC circuits do not require evaluation and that all cases of Hi/Lo pressure interfaces must be considered. PSE&G does not believe that this section indicates the need to consider multiple spurious actuations (unless a single hot short could cause more than one valve to spuriously operate) except for Hi/Lo pressure interfaces.

Question 5.3.10 "Design Basis Transients" does, however, provide guidance for how many spurious actuations must be considered. This question states:

QUESTION: "What plant transients should be considered in the design of the alternate or dedicated shutdown systems?"

RESPONSE: Per the criteria of Section III.L of Appendix R a loss of offsite power shall be assumed for a fire in any fire area concurrent with the following assumptions:

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."

The guidance in Section 5 was consistently used in Salem's Safe Shutdown Analysis for all plant areas including special cases (i.e., Hi/Lo pressure interfaces). Based on this guidance, it was assumed that fire induced failures of unprotected cabling could lead to spurious operation of a component. For each fire area, it was demonstrated that fire induced spurious operation of any component would not adversely affect the ability to achieve and maintain safe shutdown.

The NRC has identified that the Salem Appendix R program did not account for multiple potential spurious actuations due to fire damage both inside and outside those fire areas for which credit is taken for an alternate shutdown (ASD) methodology. The non-ASD areas shall be noted as balance of plant (BOP) areas. The contention is that cables for redundant trains of equipment may be unprotected and subject to fire damage on an area by area basis. The NRC perceives that a weakness exists in the Program leaving the potential for shutdown to be impeded or prevented. PSE&G embarked upon a review of systems necessary for shutdown contained in both BOP and ASD areas. The result of each review is documented below.

BOP Areas

A comprehensive review of Salem's Safe Shutdown Analysis for each fire area was conducted where reference to Generic Letter 86-10 was cited for the express purpose of identifying redundant shutdown components and their susceptibility to

fire induced spurious actuation. Included in this review was consideration of in-situ cable protection and approved exemptions. The results of the review showed that no cases existed where redundant components could spuriously actuate. Either the cabling of one component was protected or separation requirements were met or it was determined that the cable function for the subject components would not lead to spurious operation.

ASD Areas
The crux of this issue is that the NRC has introduced a new position, contrary to the above Generic Letter guidance, that more than one spurious actuation must be assumed. This position is also contradictory to that given during a November 28, 1995 telecon during which the NRC identified that Section 5.3 of Generic Letter 86-10 is only applicable to Section III.L of Appendix R, "Alternative and Dedicated Shutdown Capability." During that telecon, PSE&G was informed that the single spurious actuation assumption was only applicable to Alternate Shutdown.

Section 5.3, Conclusion
The TER indicates that Question 5.3.10 of GL 86-10 is only applicable to the evaluation of fires in areas which require an alternate shutdown capability. It is further stated that "response (a) to Question 5.3.10 indicates that the licensee must consider the occurrence of one spurious operation **prior to isolation of potentially affected circuits**." (Emphasis by PSE&G) In the next paragraph, the TER states "The safe shutdown capability for the area is evaluated considering (per GL 86-10) **one spurious operation to occur which is random and independent of those previously evaluated** and for which protection has been provided." (Emphasis by PSE&G)

PSE&G Response
In our originally submitted Safe Shutdown Analysis, PSE&G applied the above guidance of circuit analysis for spurious operation in the alternate shutdown areas (Appendix R Section III.L) and in general plant areas (Appendix R Section III.G). PSE&G used this guidance consistently for all plant areas because no specific guidance regarding spurious actuations is provided for non-alternate shutdown areas and thought it conservative to apply alternate shutdown criteria to general plant areas.

PSE&G concurs that Section 5 of Generic Letter 86-10 provides a response to a question posed specifically for Alternate and Dedicated Shutdown Capability. However, we can not find the

TER position (emphasized above) in any previously provided NRC guidance on this subject. PSE&G believes that we have applied the assumptions for spurious operations consistent with industry practice and NRC guidance to date. These assumptions do not include the need to postulate random single failures other than those failures caused by the fire.

Section 5.3, p 19

In discussing Salem's alternate shutdown procedures, the TER states, "Additionally, it should be noted that, due to man-power limitations and the complexity of required repair activities, this method of re-establishing control of affected shutdown systems may not be possible if more than one spurious actuation were to occur as a result of fire in a given area."

PSE&G Response

PSE&G believes that no supporting information is provided in the TER to substantiate this statement and that it constitutes an additional criterion to previously provided NRC guidance. PSE&G has satisfactorily demonstrated the alternate shutdown capability as part of the 1987 and 1993 NRC inspections.