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Nuclear Business Unit

SEP 27 1996

LR-N96300

United States Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

**SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION  
UNRESOLVED SAFETY ISSUE A-46  
SEISMIC QUALIFICATION OF ELECTRICAL EQUIPMENT  
SALEM GENERATING STATION UNITS 1 AND 2  
DOCKET NOS. 50-272 AND 50-311**

Gentlemen,

Public Service Electric and Gas (PSE&G) provided its initial response to the above referenced request on August 19, 1996 (LR-N96247). Therein, PSE&G committed to provide a supplemental response to address 3 NRC questions within 30 days. A nine day extension to this submittal schedule was granted by Mr. D. Brinkman of your staff on September 17, 1996.

Attachment 1 to this submittal contains PSE&G's responses to NRC questions 4, 14 and 15. If you have any questions regarding this information we will be pleased to discuss them with you.

Sincerely,

D. R. Powell, Manager  
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The power is in your hands.

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## ATTACHMENT 1 TO LR-N96300

### NRC RAI Number 4

Attachments C and D of the initial submittal and Section 3.2 of the supplemental submittal stated that as a result of the seismic event, contact chatter from numerous relays may occur and cause a "seal in" of the trip circuit. Should this "seal in" occur, operator action would be required to reset the lockout relays. It is also stated that station procedures will be modified to incorporate the requirements for such operator actions into appropriate procedures. Implementation of these procedures and training regarding the required operator actions will be implemented by April 1999 and February 1998 for Units 1 and 2 respectively. However, based on the information provided by the licensee, it is unclear as to how many operator actions are credited in resolving the potential relay lockout issue and how those operator actions were determined to be acceptable. Further, it is unclear as to how the licensee can ensure that a proper and timely operator action will be performed before a proceduralized and prioritized operator action procedure is in place. The licensee is requested to provide additional information to address the above three concerns.

### PSE&G Response

With respect to the first question, Section 3.2 of PSE&G's supplemental submittal (LR-N96083, dated March 29, 1996) identified 27 breakers which are locked out due to actuation of protective relays. Actuation of the relays in question results in lockout of the vital bus infeed breakers from the offsite distribution system, the Emergency Diesel Generator (EDG) output breakers and various load breakers on the 4kV vital busses. Assuming that offsite power is lost for an extended period of time, restoration of the EDG output breakers would potentially require the reset of the Diesel Unit Trip Relay (DUTR), EDG Breaker Failure, 4kV Bus Differential, and the 4kV Bus Overload relays on each vital bus.

During the seismic event, contact chatter is postulated in protective relays within those 4kV vital bus circuit(s) which would initiate a LOOP condition (i.e. offsite power infeed breakers tripped). The total number of operator actions required to restore a vital bus would be based on which relays are affected. It should be noted that consideration of contact chatter is being addressed by PSE&G as required by NRC Generic Letter 87-02. Consideration of contact chatter was not however part of the original Salem licensing or design basis for seismic qualification. As such, postulation of multiple actuations within the population of affected relays is considered beyond the design basis. Simultaneous actuation of all affected relays is also considered highly unlikely.

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For the loss of a single bus, no action would be required as this is within the current design basis. For the beyond design basis case, a maximum of 11 reset actions are required to restore a single vital bus (e.g., 33 actions to restore all 3 buses). These actions are performed in the Vital Switchgear Room at the affected bus, in the Relay room at the affected bus's protective relay rack, and at the corresponding EDG control panel. Following the reset of any affected relays, the EDG's can be manually aligned to the bus and loaded as required to bring the plant to a safe shutdown condition. Restoration of offsite power, if available, would require a substantially greater number of relays to be reset.

Regarding the second question, reliance on operator action is consistent with the methodology outlined in EPRI Document NP-7148-SL, "Procedure for Evaluating Nuclear Power Plant Relay Seismic Functionality", Section 3.5.2, "Operator Actions to Restore/Reset Systems". As indicated in PSE&G's initial and supplemental submittals, Salem Operations Department review of, and concurrence with the use of operator action was an integral part of PSE&G's decision to credit manual reset of these relays. At the time of PSE&G's original submittal (LR-N95073 dated May 22, 1995) the decision to rely on operator action was undergoing further review by the Salem Operations department. PSE&G's supplemental submittal (LR-N96083, dated March 29, 1996) reported that the Operations Department review concluded that reliance on operator action was a reasonable approach to addressing this condition.

To address the third concern, proceduralized and prioritized operator actions to cope with single and multiple vital bus unavailability have been in-place for some time. For the design basis case, the most limiting single relay failure would be taken coincidentally with the Safe Shutdown Earthquake (SSE) and a Loss of Offsite Power (LOOP). Under this scenario, the most limiting single relay failure would result in the loss of a vital bus and its associated train of safeguards equipment. If the Unit remains online, this condition would be addressed using procedure S1.OP-AB.4KV-0001(Q) for the loss of the 1A vital bus. Similar procedures exist for the loss of the 1B and 1C vital busses, as well as the corresponding Unit 2 vital busses. These procedures direct the necessary actions to be taken for the loss of capability presented by the single bus outage. If the Unit trips under this condition, the transient would be addressed within the framework of the Emergency Operating Procedures (EOP). The EOP's direct the necessary actions to assess and stabilize plant conditions and to bring the Unit to an orderly shutdown. The design of the Salem Units is such that safe shutdown can be achieved with 2 of 3 vital busses. As such, actuation and "seal in" of any one of the affected relays is bounded by the current plant design. For both of these scenarios, operator actions to reset affected relays is not required to bring the plant to shutdown.

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Actions to address the loss of multiple vital busses are prescribed within S1.OP-AB.LOOP-0001(Q), Loss of Offsite Power, S1.OP-AB.LOOP-0003(Q), Partial Loss of Offsite Power and 1-EOP-LOPA-1, Loss of All AC Power. These procedures provide the hierarchy of actions required to; 1) stabilize plant conditions, 2) limit reactor coolant inventory loss and maintain core cooling, and 3) reenergize the vital busses from alternate sources. Simulator instruction is conducted on these procedures for all Licensed operators. The ability to complete the 30 minute coping actions identified within S1.OP-AB.LOOP-0001(Q) has been verified via field walkdown. S1.OP-AB.LOOP-0001(Q) includes a subset of the relays in question and directs the reset of those relays as part of the offsite power restoration process. The actions associated with resetting of field relays is covered generically within the training program for Equipment Operators and as such is considered within the skill of the craft. A Shift Electrician position is also included in the Technical Specification required minimum shift crew composition. The primary function of this position is to assess the electrical condition of the vital busses and connected loads prior to and during the power restoration process.

It is worth noting that following a LOOP with less than two vital busses energized, the Emergency Plan Event Classification Guide would require the declaration of either an Alert (1 bus available) or a Site Area Emergency (no AC power available). After declaration of either of these conditions, additional personnel would be recalled to the site to supplement existing resources.

Based on the discussion provided above, PSE&G concludes that additional guidance or training specific to seismic events would only serve to enhance existing procedures and response plans. It is PSE&G's intention to incorporate appropriate procedural enhancements and conduct required training prior to startup from the fourteenth and tenth refueling outages for Salem Units 1 and 2 respectively.

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### NRC RAI Number 14

Section 3.0, "Assumptions/Limitations", of the Safe Shutdown Equipment List Report, item 3.1.10 states "Operator action is allowable as a means of providing redundancy for a component provided there is sufficient manpower and time to perform the action (Ref. 5.4, Sect. 3.2.7) and the steps are addressed in an operating procedure." Section 4.0, "Results", contains a description of required operator actions necessary to accomplish the safe shutdown function. Please provide a description of how manpower requirements and sufficient action times were analyzed for those systems/equipment which rely on operator actions for their successful operation. What field and control room simulator scenarios were developed to verify and validate that these operator actions could be accomplished in the time frame required to facilitate safe shutdown? How were potentially harsh environmental conditions factored into these analyses?

### PSE&G Response

As described in Section 3.2.8 of GIP-2, existing normal and emergency operating procedures (EOPs) are expected to be sufficient to lead operators to the use of appropriate, operational equipment and systems following a SSE, and operators are expected to be trained in their use. For this reason, it is not required that operators be aware of the specific equipment included in the SSEL. It is PSE&G's understanding based on correspondence between SQUG and the NRC dated August 21, 1992, that additional training on plant procedures is required only when it becomes necessary to change these plant procedures to achieve compatibility with the Safe Shutdown Equipment List (SSEL). Training need be provided only to the extent necessary to familiarize operators with changes to these procedures as a result of the A-46 program. As concluded in PSE&G's response to RAI Number 4, no immediate changes to existing procedures are required and, therefore, no additional training on existing normal shutdown procedures or symptom-based EOPs is considered necessary.

No additional manpower or operator action time verification studies have been undertaken. As stated in PSE&G's response to NRC RAI Number 4, Operations Department personnel participated in the review and development of the SSEL and the proposed operator actions credited for reset of the affected relays. The purpose of having Operations Department personnel involved in this process was to verify compatibility of the SSEL and the proposed operator actions with existing plant procedures and training.

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Simulator training on Abnormal and Emergency Operating Procedures is conducted on a "shift-crew" basis to assure specified actions can be accomplished with available manpower. Simulator training and action time verification for existing procedures are described in PSE&G's response to RAI Number 4.

Harsh environmental conditions were not factored into the analyses. Generic Implementing Procedure (GIP), Section 3.2.5 states that the only potential events postulated to occur, other than a design basis safe shutdown earthquake, is a loss of offsite power. For example, if the normal lighting system is powered from an external power source, then the operators may need to rely on emergency lighting or hand held lights to perform their duties. As such, other events which could cause harsh environmental conditions such as loss of coolant accidents (LOCA), high energy line breaks (HELBs) and fires have not been considered for the USI A-46 program.

### NRC RAI Number 15

For the operator actions specified in Question 14, what modifications to existing operating procedures or development of new procedures (normal, abnormal and emergency) were required and what methods were used to verify and validate that these procedures are appropriate to the circumstances.

### PSE&G Response

As previously discussed in PSE&G's response to RAI Numbers 4 and 14, no procedural changes or additional training are required at this time. Enhancements to existing procedures and training will be completed prior to startup from the fourteenth and tenth refueling outages for Salem Units 1 and 2 respectively.