



PSE&G

Public Service Electric and Gas Company P.O. Box 236 Hancocks Bridge, New Jersey 08038-0236

Nuclear Business Unit

AUG 19 1996

LR-N96247

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

**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 & Gas (PSE&G) acknowledges receipt of your letter dated June 14, 1996 on the above subject. Our responses are provided as Attachment 1 to this letter.

Should you have any questions regarding the enclosed material, we would be pleased to discuss them with you.

Sincerely,

D. R. Powell
Manager - Licensing and
Regulation

Attachments

270058

9608270460 960819
PDR ADOCK 05000272
P PDR

The power is in your hands.

11
A025

AUG 19 1996

C Mr. H. Miller, Administrator - Region I
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. L. N. Olshan, Licensing Project Manager - Salem
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Mail Stop 14E21
Rockville, MD 20852

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

Mr. K. Tosch, Manager, IV
Bureau of Nuclear Engineering
33 Arctic Parkway
CN 415
Trenton, NJ 08625

ATTACHMENT 1 TO LR-N96247

NRC RAI Number 1

Section 4.1.2 of Attachment 3 of the licensee's initial submittal and Section 4.1.2 and Table 4.1 of the supplemental submittal provide a summary of instances where the intent rather than the letter of certain caveats, as described in Appendix B of the Generic Implementation Procedure (GIP), Revision 2 (GIP-2), was met. Based on the information provided by the licensee, it is unclear as to how some equipment was determined to meet the intent of the stated caveat. Listed below are specific areas that fall in this category for which we are requesting additional information:

NRC RAI Number 1a

For all Motor Control Centers (MCCs) and some of the floor mounted distribution panels, the licensee identified them as meeting the intent but not the letter of the equipment class caveat. The MCC and distribution panels are 12" deep and are narrower than the typical depth (18 to 24 inches) of the equipment class. The licensee stated that they were judged to meet the intent of the caveat given original qualification testing and reviews performed by the Seismic Review Team (SRT). However, based on the information provided by the licensee, it is unclear as to how the qualification test is applied in the SRT's review. The staff's specific concern is the applicability of the result of the qualification test to the as-installed MCC and distribution panels at Salem. The licensee is requested to provide additional information to address this concern. In addition, the licensee is requested to confirm that all the narrower depth MCC cabinets are top braced or attached to the wall as described in Appendix B of the GIP-2.

PSE&G Response

MCCs at Salem Generating station are typically 13 inches deep. Some floor mounted distribution panels are 12 inches deep. Typical depths for the earthquake experience equipment is 18 to 24 inches for MCCs and 20 to 40 inches for distribution panels. The depth of MCCs and distribution panels did not meet the letter of the equipment class caveat but the Seismic Review Team (SRT) judged them to meet the intent of the caveat based on the SRT's review of the original seismic qualification testing for the subject equipment.

The PSE&G SRT performed a review of the seismic documentation for the MCCs and distribution panels prior to performing the final walkdowns for the equipment because the preliminary plant walkdowns of the SSEL components indicated that MCCs and some floor mounted distribution panels did not meet the bounding spectrum caveat with respect to depth.

ATTACHMENT 1 TO LR-N96247

The SRT review included the following:

- Physical dimensions and mounting configuration of the tested equipment.
- Required response spectra (RRS) for the tested equipment; type of test (i.e., testing performed) and test damping value used.
- IEEE 344 standard that equipment was qualified to.
- Functional monitoring of circuit breakers.
- Results of seismic testing such as; Did the testing response spectra envelope the RRS; Did any damage or malfunction of components occur during the test; Did any circuit breaker chatter during the test and; Did the equipment function after the test.

As a result of the review, the SRT concluded that the testing of the subject equipment was performed in accordance with acceptable industry standards and the level of seismic input was comparable with the earthquake experience database (i.e. 1.5 times Bounding Spectra).

In addition to the above review of relevant seismic testing documents, the SRT performed a seismic walkdown of the subject equipment and confirmed that the actual mounting of the equipment was in compliance with the mounting of the equipment as tested. Conservative anchorage evaluations were then performed for the subject equipment in accordance with the GIP-2 criteria. Results of anchorage evaluations showed that the MCCs and distribution panels anchorage met the GIP-2 criteria. Ample margins to the GIP-2 criteria were demonstrated using the peaks of the appropriate conservative floor response spectra.

With respect to the RAI request that PSE&G, "...confirm that all the narrower depth MCC cabinets are top braced or attached to the wall as described in Appendix B of the GIP-2", the following response is provided:

The GIP-2 Appendix B.1 caveat, "Narrower depth MCC cabinets should be top braced or attached to the wall," is interpreted by the SRT as a recommendation and not a requirement. In addition, the GIP-2 allows for review of existing documentation as part of the overall seismic qualification of equipment on the SSEL. PSE&G concluded that since there is an existing seismic test report for the subject equipment and the anchorage of the MCCs has ample margin to the GIP-2 criteria, top bracing of the narrower MCCs is not required and thus, the intent of the Bounding Spectra caveat is met.

ATTACHMENT 1 TO LR-N96247

It should be noted that the seismic walkdowns identified some MCC's (Class 1) and Instrumentation and Control panels (Class 20) as outliers due to potential seismic interactions with adjacent structures (i.e., fire barriers, pipe supports). The proposed resolution of these outliers is to provide top bracing for the affected cabinets and panels. These modifications are unrelated to the evaluation used to satisfy the Bounding Spectra caveat.

NRC RAI Number 1b

For the Air-Operated Valves stated in Section 4.1.2 of Attachment 3 of the initial submittal, are the valve, the operator, and the pipe anchored to the same support structure as described in the Bounding Spectrum Caveat 4 of Appendix B of the GIP-2? If not, provide additional information to demonstrate that the specific piping system configuration would not cause an overstressed condition.

PSE&G Response

The valve, operator and pipe are well supported and anchored to the same support structure. Therefore, bounding spectrum caveat 4 of Appendix B of the GIP is met.

NRC RAI Number 1c

For the Fluid-Operated Valves stated in Table 4.1 of the supplemental submittal, are the valve, the operator and the pipe anchored to the same support structure as described in the Bounding Spectrum Caveat 4 of Appendix B of the GIP-2? If not, provide additional information to demonstrate that the specific piping system configuration would not cause an overstressed condition

PSE&G Response

The valve, operator and pipe are well supported and anchored to the same support structure. Therefore, bounding spectrum caveat 4 of Appendix B of the GIP is met.

NRC RAI Number 1d

As indicated in Table 4.1 of the supplemental submittal, there is only a $\frac{3}{4}$ " clearance between the Instrumentation and Control (I&C) Panels and Cabinets and a nearby deluge valve. Provide additional information to demonstrate that there is no adverse seismic interaction effect of the I&C Panels and Cabinets with the nearby piping system including the deluge valve. Specifically, the licensee's response should include a discussion of the potential seismic differential motion of the equipment and the piping system vs. the $\frac{3}{4}$ " clearance. Also, it is noted that in Table 4.1, the referenced I&C Panels and Cabinets are categorized as Equipment Class 18 rather than 20 as shown in Table 4.2. The licensee is requested to address this

inconsistency.

PSE&G Response

The 3/4 inch clearance between the Hoffman type box and deluge valve as shown in Table 4.1 of the supplemental submittal is a typographical error and should instead be 1 3/4 inches as stated in the Screening Evaluation Work Sheet (SEWS) for component 713-1. The SRT stated that the piping is well supported in the direction of the 1 3/4 inch clearance and judged the out of phase seismic displacement to be much less than the actual clearance. Therefore, the SRT concluded that no adverse seismic interaction concern between the deluge valve and Hoffman type box exists.

Typically, the referenced I&C panels and cabinets listed in Table 4.1 were categorized as Equipment Class 18 rather than 20 as shown in Table 4.2 since the Hoffman type box contains solenoid valves and associated tubing and are attached directly to concrete walls with expansion anchors or to structural steel angle frames supported by the concrete floor. These components could have been classified as Class 20 or Class 18. The SRT chose to classify them as Class 18 in order to perform a more conservative analysis for the expansion anchors (i.e., 3% damping for Class 18 vs. 5% damping for Class 20 equipment). Table 4.1 has been revised to reflect these comments.

NRC RAI Number 2

In Section 2.0 of Attachment 2 of the initial submittal, the licensee stated that components coded as BR, SR, and R are included on the relay review list. The staff also noted that in Attachments A and B of the initial submittal, some components are coded B and S. However, based on the information provided by the licensee, it is unclear as to how the codes BR, SR, R, B, and S are defined. The licensee is requested to describe how these codes are defined.

PSE&G Response

The components coded BR, SR and R in Section 2.0 of Attachment 2 of the initial submittal are a subset of the Safe Shutdown Equipment List (SSEL) provided in Attachment 1 of the initial submittal. The definition for the component codes as listed in Attachment 1 of the initial submittal are as follows:

ATTACHMENT 1 TO LR-N96247

<u>Eval Type</u>	<u>Definition</u>
S	= Component requires a seismic review only.
R	= Component requires a relay review only.
B	= Component is "Rule of the Box". A seismic review will be performed on the "mother" component. The "mother" component is identified in the "ROB Component" field.
SR	= Component requires a seismic review and a relay review.
BR	= Component is "Rule of the Box". However, a relay review is required for this component which is separate from the "mother" component.
N/A	= No seismic or relay review is required for this component.

The definitions for the above "Eval Type" are consistent with the methodology of Sections 3.3.3 through 3.3.10 of the GIP. Section 2 of Attachment 2 has been revised to include a Table defining the Evaluation Type codes.

NRC RAI Number 3

In both its initial and supplemental submittals, the licensee proposed to resolve all the identified outliers by the end of 1R14 and 2R10 refueling outages. However, it is noted that these two outages as stated in the later submittal are scheduled for April 1999 and February 1998, respectively, rather than May 1998 and November 1997, as stated in the former submittal. The licensee is requested to clarify the current schedule for these two refueling outages. In addition, the licensee is requested to provide a justification to ensure that the proposed schedule for resolving all the identified outliers does not lead to a potential safety significant scenario.

PSE&G Response

Outliers were identified as part of the initial screening process. However, no outliers were identified as a result of the supplemental screening effort. All outliers are documented on Outlier Screening Verification Sheets (OSVS). The OSVSs were provided as Appendix G of PSE&G's submittal for Salem Units 1 and 2. All outliers were reviewed to determine compliance with the Salem seismic licensing/design criteria. All were found to be in compliance and therefore, none were judged to present a significant impact on the health and safety of the public. This approach is consistent with the resolution of all outliers associated with the A-46 program.

In letters dated May 22, 1995 (LR-N95073) and March 1996 (LR-N96083) PSE&G provided its schedule for resolution, future modifications and/or replacement for outliers. As stated therein, PSE&G plans to resolve all of the outliers prior to startup from the 1R14 and 2R10 refueling outages. These schedules are dependent upon receipt of a plant specific safety evaluation report which accepts the methodology for resolving USI A-46 as documented in the above submittals. Any changes to the resolution methodology as a result of NRC review will require

ATTACHMENT 1 TO LR-N96247

reevaluation of these schedules.

Based on current projections, the 2R10 outage should occur in the Spring of 1998 with the 1R14 outage taking place in the Spring of 1999. It should be noted that the scheduling of the refueling outages is a dynamic process that is dependent on completion of the present refueling outages, fuel utilization during the next operating cycle and other factors. As such, the dates provided above are only estimates and are subject to change.

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

PSE&G is reevaluating the basis for the proposed schedule associated with this activity. Our response to your concerns will be provided within 30 days of the date of this letter.

NRC RAI Number 5

For your plant structures containing equipment in the USI A-46 scope:

- a. Identify structures which have licensing-basis floor response spectra (5% critical damping) for elevations within 40-feet above the effective grade, which are higher in amplitude than 1.5 times the SQUG Bounding Spectrum.
- b. Provide the response spectra designated according to height above the effective grade identified in "5a" above, and a comparison to 1.5 times the Bounding Spectrum.
- c. With respect to the comparison of equipment seismic

ATTACHMENT 1 TO LR-N96247

capacity to seismic demand, indicate which method (Method A or Method B in Table 4-1 of GIP-2) was used to address the seismic adequacy of equipment installed on those floors as identified in "5a" above.

PSE&G Response

- a. PSE&G has previously identified these structures for Salem Units 1 and 2 in its letter LR-N92134, dated September 21, 1992.
- b. Response spectra were also transmitted in the above referenced correspondence.

With regards to a comparison of the submitted spectra to the "1.5 times Bounding Spectra", it is PSE&G's understanding that the NRC Staff and representatives of the Seismic Qualification Utility Group (SQUG) are jointly seeking resolution of the concern regarding the use of this methodology. This methodology differs from that used in licensing our plants in substantial and fundamental respects. Accordingly, it is impossible to meaningfully compare isolated aspects of the two methodologies including their relative conservatisms: any such comparisons must be made at the program level to evaluate compliance with appropriate NRC regulations concerning seismic adequacy. As such, response to this questions is being deferred pending resolution of this matter.

- c. A listing of the affected equipment and the comparison method has not been compiled due to the large number of components affected. The comparison basis is documented on the appropriate worksheets for the equipment. These worksheets are maintained onsite with other program documentation and are available for NRC review.

NRC RAI Number 6

In its initial submittal, the licensee stated that PSE&G committed to implement GIP-2. It also stated that no significant or programmatic deviations from the GIP guidance were made. Please list the deviations that were taken and provide the bases for categorizing them as insignificant.

PSE&G Response

PSE&G did not compile a list of all such minor deviations. Minor deviations from the GIP guidance are noted in documents associated with PSE&G's A-46 implementation, such as walkdown data sheets. These and other supporting documents are available on site for NRC staff audit.

Categorization of deviations was made by qualified, experienced engineers who had each completed the appropriate SQUG training

ATTACHMENT 1 TO LR-N96247

courses on the use and application of judgement for resolution of USI A-46. Representative examples of "minor" deviations are listed below:

- For Salem Generating Station, PSE&G used the format contained in the GIPPER (Stevenson & Associates) software package for the SEWS forms versus the forms contained in GIP-2.
- Use of 1 3/8 inch diameter anchor bolts/data for 1 1/2 inch diameter cast in place of J-Bolts for tanks since data for 1 1/2 inch diameter is not available.
- At Salem some expansion anchor bolts for wall mounted small electrical panels (Hoffman boxes) are less than 3/8 inch diameter, (i.e., 1/4 inch). These are below GIP guidance of 3/8 inch diameter. SRT performed a tug test to qualify equipment.
- Classification of some I&C panels as Class 18 rather than 20 for conservatism. This is discussed in response to RAI Number 1d above.

NRC RAI Number 7

Provide a detailed discussion or a reference for the method of establishing the free soil boundaries mentioned in Section 3.7 of the initial submittal, including a validation of the method.

PSE&G Response

A series of studies were performed to establish the location of the free soil boundaries for the Soil-Structure Interaction (SSI) Analysis. The objective of the studies was to ensure that the free soil boundaries established for the SSI model did not constrain interaction between the structure and its surrounding soil. A total of five (5) Finite Element SSI models were considered in the study. Soil boundaries for each model were varied in depth and radius. Each model was subjected to the same input motion (SSE). The responses were calculated and compared. From the comparison, free soil boundaries were established; beyond these boundaries, the response of the soil system reaches the free field condition. The study itself provided numerical validation for the free soil conditions over and above the free soil boundaries established. The detail study and results were documented in the Conrad Associates Report (6SO-0791).

NRC RAI Number 8

With regard to the outlier resolution for the tanks, Attachment G of the initial submittal states that the fluid hold-down force and a higher stress allowable for the tanks will be considered. Provide the bases and justification for considering these and other deviations from the GIP.

ATTACHMENT 1 TO LR-N96247

PSE&G Response

Section 5.2 of the SQUG GIP identifies the methodology to be used to identify and document outliers which do not pass the screening guidelines.

Section 5.3 of the GIP contains several generic methods for resolving outliers. As stated in the GIP, "The details for resolving outliers, however, are beyond the scope of this procedure. It is the responsibility of the utility to resolve outliers using the existing engineering procedures as they would resolve any other seismic concern."

The GIP further states that it is permissible to resolve outliers by performing additional evaluations and applying judgment to address those areas that do not meet the screening guidelines contained in the GIP and strict adherence to the screening guidelines is not absolutely required.

Attachment G of the initial submittal contains the Outlier Seismic Verification Sheets (OSVS) for the tanks. The OSVS contains a description of the proposed method for outlier resolution. The proposed method for resolution of the tanks is to perform a more refined analysis and evaluation. The evaluation criteria proposed is that contained in EPRI NP-6041, Appendix H, which is currently being used by the industry as part of the IPEEE program.

As part of the re-evaluation, the analyst will consider the tank specific effects of the fluid hold-down force; consideration will be given to the "as-built" rather than specified minimum material properties for the components which typically results in higher stress allowables.

PSE&G believes that the methods proposed to resolve outliers at Salem Units 1 and 2 are consistent with the generic methods recommended in the GIP.

NRC RAI Number 9

Page 14, Attachment 3 of the initial submittal states that all outliers were determined to have no significant impact on the health and safety of the public. Please provide the bases for that statement.

PSE&G Response

Outliers were identified as part of the initial screening process. However, no outliers were identified as a result of the supplemental screening effort. All outliers are documented on OSVSs. The OSVSs were included as part of the initial submittal as Attachment G for Salem Units 1 and 2. All outliers were reviewed to determine compliance with the plant licensing and design basis. All were found to be in compliance and therefore, none were judged to present a significant impact on the health

ATTACHMENT 1 TO LR-N96247

and safety of the public.

NRC RAI Number 10

In Section 1.0 of Attachment 2 of the initial submittal, it appears that the word "form" is a typographical error and that it should be "from" instead.

PSE&G Response

PSE&G concurs that the word "form" is a typographical error and that the word should be "from". The appropriate pages have been revised to reflect this comment.

NRC RAI Number 11

In Section 1.0 of Attachments L and M of the initial submittal, it appears that the word "precticular" is a typographical error and that it should be "particular" instead.

PSE&G Response

PSE&G concurs that the word "precticular" is a typographical error and that the word should be "particular". The appropriate pages have been revised to reflect this comment.

NRC RAI Number 12

Page 3 of the initial submittal in part states that "Recent developments at the Salem Station have brought into question the effectiveness of certain operator actions credited in our evaluation with maintaining ventilation to equipment rooms. The effectiveness of these operator actions is under review". Please provide a description of these recent developments and a status of ongoing evaluations which may impact the Safe Shutdown Equipment List (SSEL) or outlier listing.

PSE&G Response

As stated in the PSE&G initial submittal letter dated May 22, 1995, the actions required to complete this review would be performed by April 1, 1996 and transmitted to the NRC via a supplemental transmittal. By letter dated March 29, 1996, PSE&G transmitted the supplemental report. This report reflects the addition to the SSEL of vital HVAC equipment and their supporting control air system components, which supply ventilation for plant components required for the USI A-46 program. Therefore, credited operator actions for maintaining ventilation to equipment rooms as described in the initial submittal are no longer required.

NRC RAI Number 13

Additionally, page 3 of the initial submittal states in part that "The Relay Evaluation Report currently takes credit for operator action in determining the acceptability of certain relays. The desirability of this approach is under final review by the Salem Station Operations Department." Please provide a description of the current status of this ongoing evaluation and include a description of the primary issues of concern.

PSE&G Response

This evaluation was completed as part of the Supplemental Report transmitted via letter to the NRC dated March 29, 1996. The issues and evaluation are contained in Section 3.2 of the Supplemental Submittal Report. This topic is further discussed in response to NRC RAI Numbers 14 and 15.

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 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

PSE&G is reevaluating the basis for the proposed schedule associated with this activity. Our response to your concerns will be provided within 30 days of the date of this letter.

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 indicated in PSE&G's response to NRC RAI Numbers 4 and 14, the schedule for this activity is under review. PSE&G's response to this question will be provided within 30 days of the date of this letter.