



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 25, 1996

MEMORANDUM TO: John F. Stolz, Lead Project Director
Project Directorate 1-2
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

FROM: Daniel H. Dorman, Lead Project Manager *Daniel H. Dorman*
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF MEETING WITH SEISMIC QUALIFICATION UTILITY GROUP
(SQUG) STEERING GROUP

On August 28, 1996, pursuant to notice, the NRC staff met with representatives of the SQUG Steering Group in Rockville Maryland, to discuss issues related to the implementation of the Generic Implementation Procedure, Revision 2 (GIP-2) for resolution of Unresolved Safety Issue (USI) A-46. The meeting was requested by SQUG to respond to generic and plant-specific concerns expressed by the staff as a result of findings identified during plant audits and during the review of licensees' A-46 submittals.

The meeting concentrated on the technical adequacy of the use of ground response spectra to estimate seismic demand. The GIP-2 provides an alternative criteria for comparison of seismic demand with the seismic capacity which may lead to the use of a demand spectrum less conservative than that specified in a plant's licensing basis. The staff raised its concerns after an NRC audit of the Browns Ferry Nuclear Power Plant in-progress seismic walkdown conducted in October 1995 for the implementation of the USI A-46 program. SQUG indicated that, for some nuclear power plants, there may exist different in-structure response spectra (IRS) in licensing documents for different programs or different purposes. They further indicated that the fact that the IRS exist in a licensing document does not imply these IRS are the licensing basis for USI A-46 programs unless a licensee had an explicit commitment of using certain IRS for equipment qualification. SQUG and the staff also discussed SQUG's August 16, 1996, generic response to issues identified by the staff during recent reviews of licensees' USI A-46 submittals. (SQUG's response is enclosed with this summary as Enclosure 1.)

During the meeting, the staff clarified its technical concerns. The staff expressed the need for a rigorous evaluation regarding licensees' incorporation of the GIP in their respective FSARs via 50.59 evaluations in situations when the GIP contains procedures that may lead to the use of less conservative criteria than those already specified in the licensing basis for a particular facility. SQUG agreed to continue its assessment of the issue on the use of ground response spectra to estimate the seismic demand, and the staff agreed to provide comments on SQUG's August 16, 1996, generic response to specific RAI items transmitted to A-46 licensees. *DFC/1*

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RD-16-6
96-135 X D-11-6 meeting

October 25, 1996

Enclosure 2 to this memo is the list of participants in the August 28, 1996 meeting. Enclosures 3 through 5 contain slides used by SQUG in its presentations at the meeting.

- Attachments:
1. Letter from N. Smith (SQUG) to
D. Dorman (NRC) dated August 19, 1996
 2. Attendance List
 3. Use of the SQUG GIP Methods for Demonstrating Seismic
Adequacy of Nuclear Plant Equipment
 4. Seismic Demand Review & Acceptance
 5. Other Generic RAIs

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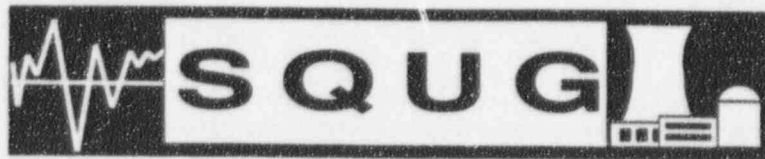
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NAME	DDorman <i>DD</i>	EPeyton <i>esp</i>	JStolz <i>JS</i>						
DATE	10/24/96	10/24/96	10/25/96						

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August 19, 1996

Mr. Daniel H. Dorman
U.S. Nuclear Regulatory Commission
Office of Nuclear Reactor Regulations
11555 Rockville Pike - Mail Stop 0-14D1
Rockville, MD 20555

Subject: SQUG Response to Certain Generic Issues Included in RAI's Sent to SQUG
Member Utilities Implementing USI A-46

Dear Mr. Dorman:

During the past year and a half, members of the Seismic Qualification Utility Group (SQUG) have been submitting summary reports to the NRC describing their implementation of the USI A-46 program based on the methodology contained in Revision 2 of the Generic Implementation Procedure (GIP-2) and the Supplemental Safety Evaluation Report No. 2 (SSER #2). The NRC staff has been reviewing these reports and sending requests for additional information (RAIs) to SQUG members. We have reviewed a number of these RAIs and find that some of the questions being asked have generic implications or are not consistent with GIP-2 and SSER #2. The purpose of this letter is to draw your attention to these questions and provide our generic responses to them.

The topics included in the generic questions discussed in the enclosure to this letter are:

- Use of Ground Response Spectra for Estimating Seismic Demand
- Harsh Environmental Conditions
- Operator Training on SSEL
- Listing and Justifying Insignificant Deviations From the GIP
- Lateral Load Ductility Evaluation of Cable Trays
- Seismic Adequacy of Relays Mounted on Diesel Generators and Air Compressors

We have advised our members that if they receive questions covering these topics, they may consider the generic responses described in the enclosure in formulating their responses.

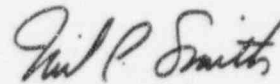
August 19, 1996

We expect that individual utilities will customize their own responses based on these generic responses, and will provide additional plant-specific information as appropriate.

If other questions from future RAIs have generic implications or we believe are not consistent with GIP-2 and SSER #2, we plan to provide appropriate generic responses for our members' use. We also plan to notify you of these questions and provide our generic responses.

As you know, we plan to meet with you and other NRC Staff on Wednesday, August 28, to discuss the first topic, "Use of Ground Response Spectra for Estimating Seismic Demand." We would be pleased to discuss any of the other generic questions and our generic responses with you at that time, or at a later date, if desired.

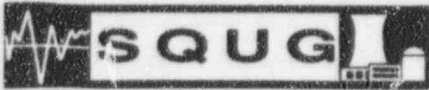
Sincerely,



Neil P. Smith, Chairman
Seismic Qualification
Utility Group

Enclosure

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SQUG Representatives and Alternates
SQUG Steering Group
R. Kassawara, EPRI



Enclosure to
SQUG Letter Dated
August 16, 1996

SQUG Response to Generic Questions In NRC Requests for Additional Information

The following generic questions (or variations thereof) have been asked of one or more SQUG member utilities by the NRC staff in Requests for Additional Information (RAI). SQUG's generic response to these RAI questions are provided. Although not complete responses, we expect that individual utilities will customize their own responses based on these generic responses, and provide additional plant-specific information as appropriate.

1. Use of Ground Response Spectra for Estimating Seismic Demand

Some members of the NRC staff have expressed the concern that the GIP method for estimating in-structure response spectra (ISRS), based on multiplying 1.5 times the SSE ground response spectra (1.5 x GRS), in some cases may result in lower loads than using "licensing basis" ISRS. This issue has been documented in an NRC staff audit trip report related to the Browns Ferry Nuclear Power Plant, dated June 19, 1996, and in the NRC letter dated August 6, 1996, which forwards the Staff's Safety Evaluation of GIP-3. Information to address this issue has been asked of SQUG members in RAIs. The questions being asked are reproduced below.

NRC Questions

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

- a. Identify structures which have licensing-basis floor response spectra (5% damping) for elevation 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] item a above and a comparison to 1.5 times the Bounding Spectrum.*
- c. With respect to the comparison of equipment seismic 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 item a above.

As we understand, the NRC Staff recognizes the mutual benefit of resolving this issue on a generic basis and plans to pursue this issue with SQUG, as described in the Browns Ferry audit trip report and the NRC evaluation of GIP-3. Therefore if such questions are asked by the NRC staff in RAIs, SQUG has recommended to its members that their response be deferred until this generic issue has been resolved. Responding to this request will require commitment of utility resources which may not be necessary if this issue is resolved generically.

SQUG's Generic Response

"The NRC Staff asked a question related to the use of 1.5 times the plant SSE ground response spectra as a realistic estimate of seismic demand under certain limited conditions as specified in the GIP. Currently, the NRC Staff and representatives of the Seismic Qualification Utility Group (SQUG) jointly are seeking resolution of this issue. Accordingly, SQUG recommends that each member licensee's response to these questions be deferred pending this resolution.

It is SQUG's position that the GIP methodology, as a whole, has been reviewed and approved by the NRC Staff in Supplementary Safety Evaluation Report No. 2 dated May 22, 1992, as an acceptable method of demonstrating the seismic adequacy of equipment within its scope. This new approved methodology differs from that contained in each SQUG member licensee's licensing basis in substantial and fundamental respects. Accordingly, it is impossible to meaningfully compare isolated aspects of the two whole methodologies including their relative conservatism; any such comparison must be made at the program level to evaluate compliance with appropriate NRC regulations concerning seismic adequacy."

2. Harsh Environmental Conditions

The NRC has asked several licensees to describe the harsh environmental conditions which might exist following a safe shutdown earthquake (SSE) and could inhibit the operators' ability to perform designated activities. Representative questions on this topic from one of the RAIs sent to a SQUG member are reproduced below.

NRC Question

State whether any of the operator actions specified in the normal and emergency procedures . . . require in-plant actions by the operations crew. If

so, outline how potential harsh environmental conditions were factored into the analysis. . . ."

. . . for certain trips of the DGs an operator must go to the local DG control panel or the 4 kV switchgear to reset the controls. Given the postulated design basis earthquake, describe what harsh environmental conditions might exist that would inhibit the operators' ability to access these local areas. Indicate how these conditions were factored into the analysis.

SQUG's Generic Response

"GIP-2, Section 3.2 sets forth the criteria and assumptions used for identifying safe shutdown equipment. Specifically, 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. Other events which could cause harsh environmental conditions such as loss of coolant accidents (LOCAs), high energy line breaks (HELBs), and fires do not have to be considered for the USI A-46 program. Therefore the only "harsh environmental conditions" which must be considered for resolution of USI A-46 are those which are associated with the SSE and loss of offsite power.

3. Operator Training on SSEL

The NRC has asked several licensees to describe the specific operator training provided to operating crews to ensure they are knowledgeable of the SSEL. A representative question on this topic from one of the RAIs sent to a SQUG member is reproduced below.

NRC Question

Detail the specific operator training that was provided to ensure all operating crews were knowledgeable of the SSEL and the procedural guidance expected to be used during a postulated earthquake.

SQUG's Generic Response

"Section II. 3.2.8 of GIP-2 states that existing normal and emergency operating procedures (EOPs) are expected to be sufficient to lead operators to use of appropriate, operational equipment and systems following a SSE, and operators are expected to be trained in their use. As stated in the SQUG (Neil Smith) letter to the NRC (James Partlow) dated

August 21, 1992, SQUG's understanding of the NRC staff's position on operator training (as described in SSER #2, Section II.3, Evaluation and Conclusion, item 2) is that appropriate training on plant procedures is required only when it becomes necessary to change these plant procedures to achieve compatibility with the 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. No additional training on existing normal shutdown procedures or symptom-based EOPs is considered necessary, nor is it necessary for operators to have specific knowledge of which items of equipment are on the SSEL. The purpose of the Operations Department review of the SSEL is to verify compatibility with plant procedures and training so that operators will be able to use the SSEL equipment if other choices are not available following a SSE."

4. Listing and Justifying Insignificant Deviations From the GIP

The NRC has asked a licensee to list the insignificant deviations from the GIP which were made during the USI A-46 program and provide the bases for categorizing these deviations as insignificant. The question from the RAI sent to a SQUG member is reproduced below.

NRC Question

In its initial submittal, the licensee stated that [Utility Name] 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.

To properly respond to this request for additional information, it is important to understand the requirements regarding documentation and reporting of deviations from the GIP and SSER #2. In Part I, Section 1.3 of GIP-2, the two groups of information included in Sections 2 through 9 of Part II of the GIP are described, i.e., commitments and guidance. SQUG commitments are key features of the GIP methodology located at the beginning of GIP sections. Implementation guidance, included in the remaining portion of each section of the GIP, describes acceptable methods for implementing the SQUG commitments.

Substantial deviations from the SQUG commitments must be reported and justified to the NRC prior to implementation. However, licensees may use clearly equivalent methods in place of the implementation guidance without prior notification of the NRC. Nevertheless, licensees must notify the NRC of significant or programmatic deviations from the GIP guidance no later than the final USI A-46 summary report. Justification for these significant or programmatic deviations must be prepared and made available onsite for NRC audit. However, the NRC cautioned in SSER #2 that deviations from the GIP may

not be acceptable to the NRC staff and may result in the licensee not fully satisfying the provisions of the Generic Letter.

Section I.1.3 of the GIP states that it is not necessary to notify the NRC of minor deviations from the GIP guidance or to justify these deviations. The documentation of minor deviations should be available onsite for NRC audit.

The RAI question asks not only for a list of such deviations, but also asks that bases be provided for categorizing such deviations as "minor." It appears to us that the reason the NRC staff is asking this question is to better understand how the licensee is interpreting the distinction between "significant and programmatic" deviations compared to "minor" deviations from the GIP. These terms are not defined in the GIP or SSER #2. The difficulty with providing a direct answer to this RAI is that it may be necessary to expend significant resources to compile a list of all the documented "minor" deviations in the plant-specific implementation of the GIP, and especially to justify them as being minor. Also, if some of the "minor" deviations are not identified in the response to the RAI, the licensee may be subject to enforcement action if these missed deviations are later identified.

SQUG's Generic Response

"Minor deviations from GIP guidance are noted in documents associated with each member licensee's A-46 implementation, such as walkdown data sheets. Typically each licensee does not attempt to list all such minor deviations in one centralized location. As described in Section I.1.3 of the GIP, these documents are available on site for NRC staff audit. Determinations of whether each deviation was "minor" were made by qualified, experienced engineers who had each completed the appropriate SQUG training courses on the use and application of judgment for resolution of USI.

5. Lateral Load Ductility Evaluation of Cable Trays

The NRC has asked a licensee to provide the procedure for the ductility evaluation associated with the lateral load check on cable trays and to describe the bases for the approach used. The question from the RAI sent to a SQUG member is reproduced below.

NRC Question

The report states that cable trays were evaluated for lateral load ductility to ensure that there were no brittle failure modes. Provide the procedure for the ductility evaluation and discuss the bases for the approach, including any references used. In particular, discuss how the ductility is accounted for in the dynamic response analysis.

SQUG's Generic Response

"As we understand, each member licensee used the ductility evaluation procedure contained in Section II.8.3.3 of the GIP for the Limited Analytical Review of cable trays supports. The approach used in this procedure is based on back-analyses of many cable tray and conduit supports which experienced significant earthquake loadings. These back-analyses predicted yielding of members and connections. However, these support systems performed well, with no visible signs of distress. The justification for use of this method is described in GIP Reference 9, EPRI Report NP-7151, "Cable Tray and Conduit System Seismic Evaluation Guidelines," March 1991. The GIP procedure for ductility evaluations does not require a dynamic response analysis to be performed on cable tray systems. Supplemental Safety Evaluation Report No. 2 (SSER #2) on GIP-2 accepts this GIP procedure for evaluating the ductility of cable tray supports under lateral loading."

6. Seismic Adequacy of Relays Mounted on Diesel Generators and Air Compressors

The NRC has asked a licensee to demonstrate by calculation and/or testing that normal vibration of equipment (engine generators and air compressors) supporting relays is more severe than the vibration induced by a design basis seismic event. The question from the RAI sent to a SQUG member is reproduced below.

NRC Question

In reference to [the section of the summary report which discusses relays mounted on vibrating equipment], demonstrate by calculation and/or testing that normal operational vibration of equipment supporting these relays is more severe than the vibration induced by a design basis seismic event.

SQUG's Generic Response

"SQUG does not consider it necessary to perform detailed calculations and/or testing of relays mounted on reciprocating engines and air compressors since such relays mounted on engine generators and air compressors routinely experience high vibration during start-up and normal operation.

"The Senior Seismic Review and Advisory Panel (SSRAP) takes the position in their report (GIP reference 5), that it is unnecessary to perform explicit seismic capacity versus demand evaluations of relays on

reciprocating engines (page 81) and air compressors (page 82) that routinely see high vibration due to operation.

"We also note that this method of screening relays mounted on diesel generators is included as an explicit example in Appendix B of EPRI report NP-7148. The report is the basis for the relay evaluation procedure in the GIP and is intended to be used for implementing this procedure. Note that this EPRI report states (on page B-69) that relay-type control devices 'are considered seismically adequate since they are mounted on the diesel engine and subject to significant vibration on a normal basis.'

"Based on these elements of the GIP procedure, each member licensee's Seismic Capability Engineers were trained to evaluate the normal vibration of the engine generators and air compressors which support the subject relays and typically found that they are significant. This evaluation is based on the engineering judgment of qualified and experienced Seismic Capability Engineers as defined in the GIP. Therefore a detailed seismic capacity versus demand evaluation is considered beyond the scope of the GIP."

PARTICIPANTS
NRC & SQUG STEERING COMMITTEE
AUGUST 28, 1996

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PARTICIPANTS
NRC & SQUG STEERING COMMITTEE
AUGUST 28, 1996

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Use of the SQUG GIP Methods for Demonstrating Seismic Adequacy of Nuclear Plant Equipment

Presented by SQUG to
NRC Staff

August 28, 1996

Topics to Discuss

- Objectives of meeting
- NRC questions and perspective
- Background
- Current status of GIP and A-46 program
- GIP review and acceptance process
- SQUG perspective
- Conclusions

Objectives of Meeting

- Understand NRC questions
- Present SQUG perspective
- Assist in resolving NRC concerns
- Agree on course of action

Background

- Licensing basis seismic qualification requirements for older nuclear plants not definitive or consistent with current criteria
- Objective of A46 resolution (NUREG-1211*, February 1987)

"The specific objective of the A46 task was to develop viable, cost-effective alternatives to current seismic qualification licensing requirements to be applied to operating nuclear power plants"

- SQUG, NRC, SSRAP developed new, fundamentally different methodology which meets NUREG-1211 objective and is now embodied in GIP

* NUREG-1211 is the regulatory analysis for resolution of USI A-46

Current Status of GIP and A-46 Program

- GIP-2 accepted by NRC SSER#2 in 1992 and implemented over past 3+ years
- USI A-46 resolution essentially complete in ~60 SQUG member units
- Program has provided significant accomplishments:
 - Identified real seismic issues based on actual earthquake experience
 - Verified seismic capabilities and provided real safety improvements in many plants based on physical inspections of as-built conditions

Current Status of GIP and A-46 Program (Cont'd)

- Program development and implementation represent an important success story for industry and regulator, with a safe, innovative, cost-effective result
- GIP methodology has since gained widespread acceptance and use by several national standards organizations and 8 foreign utilities
- More recent strong motion earthquakes continue to validate the SQUG method

GIP Review and Acceptance Process

- GL 87-02 requires seismic review of equipment against criteria not in use when plants were licensed
- Seismic experts from industry, academia, and government thoroughly reviewed earthquake experience data and developed the criteria and guidelines in the GIP, including methods for defining seismic demand

GIP Review and Acceptance Process (Cont'd)

- NRC staff was substantially involved in all aspects of GIP development and endorsed its use as an alternative to seismic equipment qualification (SEQ) methods currently being used on newer plants. Specifically, SSER #2 concludes in page 5:

"The implementation of the GIP-2 approach for USI A-46 plants provides safety enhancement, on certain aspects, beyond the original licensing bases. Therefore, GIP-2 methodology is an acceptable evaluation method, for USI A-46 plants only, to verify the seismic adequacy of the safe shutdown equipment and to satisfy the pertinent equipment seismic requirements of General Design Criterion 2 and the purpose of the NRC regulations relevant to equipment seismic adequacy including 10 CFR Part 100."

GIP Review and Acceptance Process (Cont'd)

- GIP methodology differs from A-46 plant licensing bases in substantial and fundamental respects; includes many elements and conservatisms not included in conventional methods
- Not meaningful or appropriate to evaluate individual elements of GIP independent of overall methodology

SQUG Perspective

- The GIP methodology, taken as a whole, was accepted as an alternative method to existing licensing bases for demonstrating seismic adequacy
- The GIP approach is unique in that definitions of seismic capacity and demand are tied together
- The overall conservatism of such new and fundamentally different technologies were, and should continue to be evaluated at the program level

SQUG Perspective (Cont'd)

- It is not meaningful to evaluate the conservatism of individual elements of such new technologies independent of the overall methodology
- Many precedents for this position exist: ASME codes, AISC Code, Reg. Guide 1.61 damping, etc.

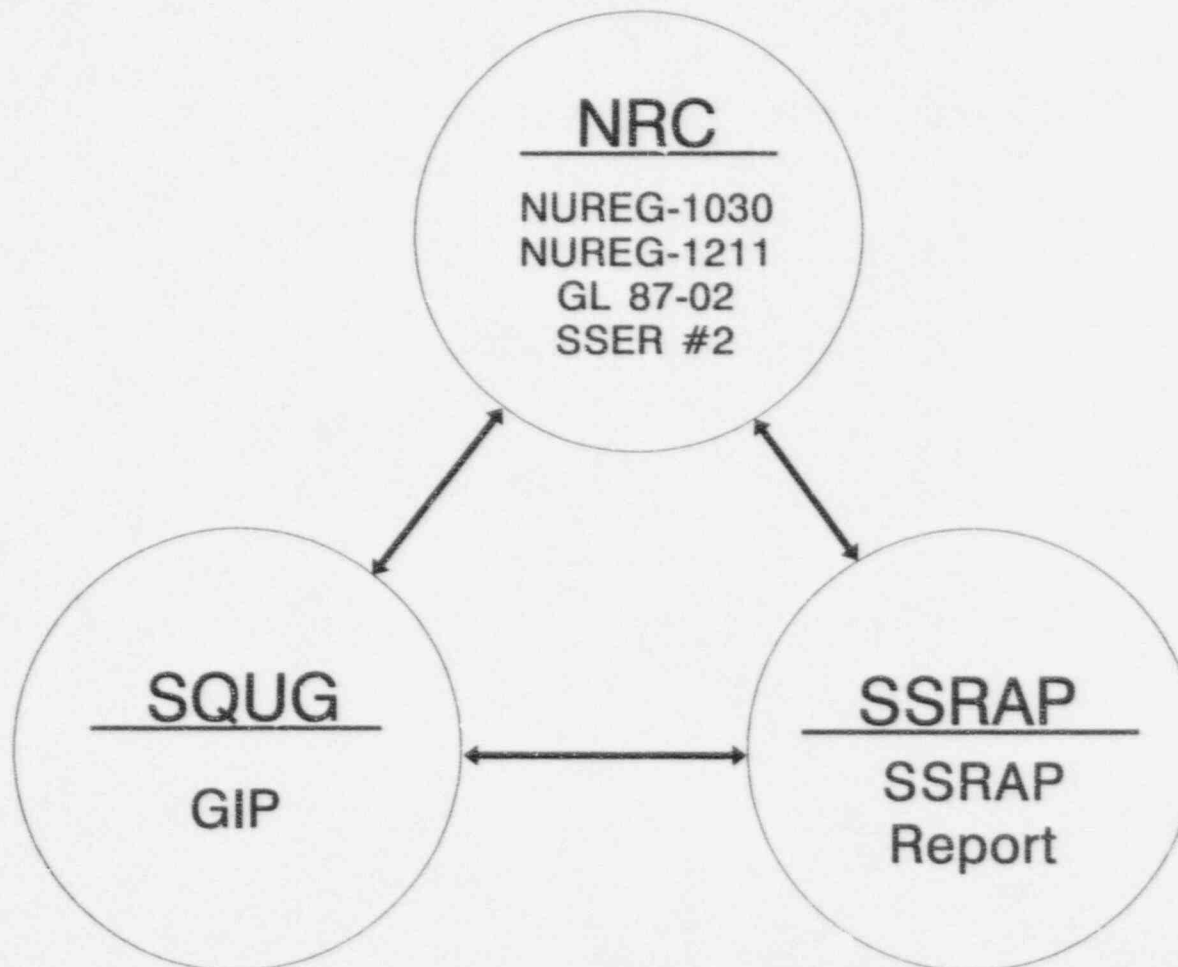
Conclusions

- There is no licensing basis compliance issue with respect to use of the GIP
- GIP approach, taken as a whole, is an acceptable alternative method for assuring seismic adequacy of equipment in A-46 plants

Seismic Demand Review & Acceptance

Presented by SQUG to
NRC Staff
August 28, 1996

Seismic Demand Review & Acceptance



History of the Development and Review of 1.5 x GRS for ISRS

- 1/85 SSRAP draft report: Proposes overall method for 8 classes of equipment.
- 2/87 NRC GL 87-02: Endorses SSRAP approach.
- 3/87 SQUG initial draft of GIP: Uses 1.5 x GRS for elevations below 40' for equipment and anchorage evaluations.
- 5/87 Trial Plant Review #1: Used 1.5 x GRS for evaluations. (NRC participated in review)
- 10/87 SSRAP draft report: Recommends use of 1.5 x GRS for equipment < 40' with $f_n > 8$ Hz
- 2/88 Trial Plant Review #2: Used 1.5 x GRS for equipment and anchorage evaluations. (NRC participated in review)

History of the Development and Review of 1.5 x GRS for ISRS (Cont'd)

- 6/88 SQUG GIP-0: Includes use of 1.5 x GRS for equipment and anchorage evaluations.
- 7/88 NRC GSER: Review includes general procedure and major implementation steps in GIP-0 and SSRAP report. Result:
- No exceptions taken to use of 1.5 x GRS
 - Open issue regarding use of Bounding Spectrum for MOVs
- 12/88 SQUG GIP-1: No change to use of 1.5 x GRS guidelines and criteria. Resolved open issue from GSER on use of Bounding Spectrum for MOVs.
- 2/91 SSRAP final report: No change to use of 1.5 x GRS.
- 2/91 SQUG GIP-2: No change to use of 1.5 x GRS.
- 5/92 NRC SSER #2: Accepts GIP methodology without taking any exceptions to use of 1.5 x GRS. NRC asked each licensee to submit detailed information on procedure and criteria used to generate ISRS.

SSRAP Report

- SSRAP = Industry experts selected by NRC and SQUG for A46 Methodology Technical Review
- SSRAP developed 1.5 factor floor response methodology
 - Elevations < 40 feet above ground
 - Equipment frequencies > 8 hz
- SSRAP recognized ISRS typically very conservatively computed (pgs 101, 102)
 - NRC SSMRP (LLL-TB-026, NUREG/CR-1489) demonstrated factors of conservatism of 1.5 to 8
 - Measured spectra demonstrate amplification < 1.5 at:
 - Pleasant Valley Pump Station
 - Humbolt Bay Nuclear Plant
 - Fukushima Nuclear Plant

SSRAP Report (Cont'd)

“Thus, it is SSRAP’s judgment that amplifications greater than a factor of 1.5 are unlikely in stiff structures at elevations less than 40 feet above grade, except possibly at the fundamental frequency of the building where higher amplifications might occur when such a frequency is less than about 6 Hz.”

“Thus, for equipment with fundamental frequencies greater than about 8 Hz in their as-anchored condition, it was judged that floor spectral amplifications within 40 feet of grade would be less than 1.5 when reasonably computed using more median-centered approaches.”

[SSRAP Report, 2/28/91, pg 102]

SSRAP Report (Cont'd)

"It was judged by SSRAP that the use of very conservative floor spectra should be avoided when assessing the seismic ruggedness of floor-mounted equipment."

"To avoid the burden of having to compute more realistic floor spectra, SSRAP decided to anchor its conclusions to ground spectra at the nuclear plant sites in those cases where this was judged to be reasonable."

[SSRAP Report, 2/28/91, page 102]

NRC Documentation

Generic Letter 87-02

- GIP-2 methodology in the staff's judgment satisfies GDC 2
- Requires the data base spectra to envelop the site free-field spectra at the ground surface defined for the plant (Enclosure pg. 3)
- States that, as an alternative, 1.5 x free field horizontal SSE may be used to estimate seismic demand for equipment mounted less than 40 feet above grade (Enclosure, pg. 5)
- States it is acceptable for comparison of seismic capacity to demand to compare the Bounding Spectrum to the horizontal ground response spectrum for equipment less than 40' above grade in moderately stiff structures (Enclosure, pg. 8, 9)

NRC Documentation (Cont'd)

NUREG-1211 Regulatory Analysis for Resolution of USI A-46

- Stated objective to develop viable, cost-effective alternative to current seismic qualification licensing requirements (pg. 1)
- Specifies that the Bounding Spectra must envelop the site free field spectra at the ground surface for equipment mounted less than 40' about the ground surface (pg. 6)
- Also states that, as an alternative, 1.5 times the free-field horizontal design ground spectrum may be used to estimate the equipment demand for equipment mounted less than 40' above grade (pg.13)
- NRC backfit evaluation of safety benefit:
 - The NRC staff has closely followed the SSRAP work and is in broad agreement with its conclusions (pg. 17)
 - Staff concludes that if SSRAP spectral conditions are met, it is unnecessary to perform explicit seismic qualification (pg. 17)

NRC Documentation (Cont'd)

NRC SSER No. 2

- Staff states the screening procedures and criteria of the GIP are adequate and acceptable subject to staff clarifications or exceptions as stated in the SSER (pg. 12)
- SSER #2 contains no staff clarification or exceptions related to using the free field design ground response spectra (GRS) comparison or the use of 1.5 x GRS for estimating seismic demand
- SQUG Conclusion: NRC agrees with the validity of the SQUG GRS comparison method (Method A)

A-46 Response Determination (GIP Methodology)

Plant
Design Spectra

1.5 x Ground
Response Spectra

Generate Median
Centered Spectra

- Applies < 40' Above Grade
- Equipment > 8 Hz

Other Generic RAls

Presented by SQUG to
NRC Staff
August 28, 1996

Other Generic RAIs

RAIs sent to SQUG members which have generic implications or are inconsistent with GIP-2 and SSER

- Harsh Environmental Conditions
- Operator Training on SSEL
- Listing and Justifying Insignificant Deviations from the GIP
- Lateral Load Ductility Evaluation of Cable Trays
- Seismic Adequacy of Relays Mounted on EDGs and Air Compressors

Harsh Environmental Conditions

NRC RAI: Outline how potential harsh environmental conditions were factored into the A-46 evaluation.

SQUG Response:

- Only potential events postulated to occur is SSE and loss of offsite power
- Other events, such as LOCAs, HELB, fires, floods, etc., do not have to be considered

Operator Training on SSEL

NRC RAI: Describe operator training to ensure all crews know which items of equipment are on SSEL

SQUG Response:

- Existing normal and emergency operating procedures (EOPs) are sufficient to lead operators to use of appropriate, operational equipment and systems following an SSE without explicit knowledge of SSEL
- Operators are already trained in use of plant procedures
- Operations review of SSEL verifies compatibility with plant procedures and training
- Additional training only needed for changes in procedures

Listing and Justifying Insignificant Deviations

NRC RAI: List all insignificant deviations from the GIP and provide basis for categorizing them as insignificant.

SQUG Response:

- Not necessary to notify NRC of minor deviations to GIP or to justify these deviations (GIP Part I, Section 1.3)
- Qualified, experienced engineers make judgment of which deviations are “minor”
- Significant effort needed to compile a list of all documented “minor” deviations from the GIP
- Examples of “minor” deviations include use of SEWS forms from GIP-2A and GIPPER instead of from GIP-2

Lateral Load Ductility Evaluation of Cable Trays

NRC RAI: Provide the procedure for lateral load ductility evaluations and discuss the bases for the approach including how ductility was accounted for in the dynamic response analysis.

SQUG Response:

- Ductility evaluation procedure is found in GIP Section 8.3.3 and accepted in SSER #2
- Basis for approach is back-analysis of cable tray supports which survived significant seismic loadings (EPRI NP-7151)
- Ductility based upon inspection guidelines in GIP
- Dynamic response analysis not required in GIP

Seismic Adequacy of Relays Mounted on EDGs and Air Compressors

NRC RAI: Demonstrate by calculation and/or testing that normal operational vibration EDGs and air compressors which support essential relays is more severe than SSE vibrations.

SQUG Response:

- Relays mounted on EDGs and air compressors routinely experience high vibration during startup and normal operation and need not be reviewed per GLP, Section 5 (SSRAP Report pages 81, 82; EPRI NP-7148, page B-69)
- Evaluation may be based on engineering judgement of qualified and experienced SCEs without performing detailed calculations and/or testing.