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

May 26, 2000

LICENSEE: THE SEISMIC EXPERIENCE-BASED QUALIFICATION OWNERS GROUP (SEQUAL)

FACILITY: GENERIC (MULTI-UNIT/SITE)

SUBJECT: SUMMARY OF MEETING WITH SEQUAL ON MARCH 20, 2000, TO DISCUSS USE OF USI A-46 GENERIC IMPLEMENTATION PROCEDURE FOR NON-A-46 COMMERCIAL NUCLEAR POWER PLANTS

On March 20, 2000, representatives of the U.S. Nuclear Regulatory Commission (NRC) staff met in a public meeting with members of SEQUAL at NRC Headquarters in Rockville, Maryland. The purpose of the meeting was to continue the discussion (see NRC meeting summary dated November 16, 1999) of the use of the Unresolved Safety Issue (USI) A-46 resolution document, Generic Implementation Procedure, Revision 2 (GIP or GIP-2), for newer nuclear power plants that are not included in the scope of USI A-46 and whose licensing bases do not include any of the GIP-2 provisions. The GIP-2 methodology was specifically developed for the resolution of USI A-46 at those nuclear power plants affected by NRC Generic Letter 87-02, *Verification of Seismic Adequacy of Mechanical and Electrical Equipment in Operating Reactors, Unresolved Safety Issue (USI) A-46*, dated February 19, 1987.

Enclosure 1 is a list of persons attending the meeting. Enclosure 2 is a list of the agenda topics provided by the NRC prior to the meeting. Enclosure 3 is a handout passed out to attendees by SEQUAL during the meeting.

Summary

Mr. Fisicaro, representing SEQUAL, requested the NRC staff to define the issues that the staff finds relevant to the application of GIP-2 methodology for newer plants designed to comply with current seismic requirements of Appendix A to Title 10, Part 100 of the *Code of Federal Regulations,* "Reactor Site Criteria." The staff indicated that, although summaries are being prepared for internal use, no formal official staff position documents are planned. SEQUAL is proposing the use of the GIP-2 methodology as an equipment qualification procedure for new and replacement equipment at non-USI A-46 plants. As stated in the summary for the September 17, 1999, meeting, the NRC staff considers the proposed use of the GIP-2 criteria and processes for all equipment in non-USI A-46 plants a significant relaxation from the level of seismic ruggedness currently required for equipment in these plants. The NRC staff further noted that GIP-2 was originally prepared and approved as an approach for determining seismic adequacy, as apposed to seismic qualification. SEQUAL proposes that the Seismic Qualification Utilities Group (SQUG) seismic experience data base for various classes of equipment and the GIP-2 methodology be allowed to substitute for the 10 CFR Part 100 requirement to use "either a *suitable dynamic analysis or a suitable qualification test* to demonstrate that the structures, systems and components can withstand the seismic and other concurrent loads. . . ."

Agenda topic Items 1 and 2 (see Enclosure 2) were discussed. These items address the requirement in Section VI of Appendix A to 10 CFR Part 100, "Application to Engineering Design," that concurrent functional and accident-induced loads be accounted for in determining that safety-related structures, systems and components remain functional during and after design-basis seismic events. There was agreement that concurrent functional and accident-induced loads are not specifically addressed by the GIP-2 process. SEQUAL suggested that these items could be covered by supplemental analyses and that some components could be excluded from concurrent induced load provisions, if the concurrent loads were not applicable during a seismic event. It was generally agreed that, for boiling water reactors with Mark II and Mark III containments, safety relief valve blowdown loads and other hydrodynamic loads were not addressed by the GIP-2 methodology because the excitation frequency of these loads was in the range of 100 Hz (well above the 5 to 10 Hz excitation represented by the earthquake experience data included in the SQUG database). Mr. Wessman commented that the Senior Seismic Review and Advisory Panel recommendations were focused more on equipment survival adequacy and not on a rigorous seismic qualification. The staff asked whether SEQUAL was proposing that the GIP-2 methodology be used to demonstrate that pressure boundary components would not exceed the allowable stresses specified in Section III of the American Society of Mechanical Engineers Code. SEQUAL indicated that the GIP-2 methodology could not be used for seismic qualification of pressure boundary components.

The third discussion topic item is associated with use of the GIP-2 bounding spectrum (BS) to represent equipment capacity in future seismic qualification approaches. The GIP-2 BS was developed to be the lower bound of the ground motions experienced by the earthquake experience database facilities. The BS was obtained by multiplying the GIP-2 reference spectrum (RS) by 2/3. The RS is the smoothed average of the four highest amplitude response spectra in the earthquake experience database. These are 1) the Pleasant Valley Pumping Plant recording of the Coalinga Earthquake, 2) a modified Pacoima Dam recording of the San Fernando Earthquake, 3) the El Centro recording of the Imperial Valley Earthquake and 4) the Llolleo recording of the Chile Earthquake. More recent information indicates that the estimates of the ground motion for the first two of these sites are higher than the sites actually experienced. There is a definite topographic amplification of the ground motion used for the Pleasant Valley Pumping Plant above the motion actually experienced at the plant since the seismograph was located on a hill 80-feet above the plant. Also, the Pacoima Dam recording, scaled to 0.5g, is an overestimate of the ground motion from the 1971 San Fernando earthquake at the Sylmar Converter Station. The staff pointed out that, while most of the equipment experienced ground motion above the level of the BS, little or no equipment experienced ground motions at the RS level. Therefore, the NRC staff does not agree with SEQUAL that the RS represents the equipment capacity spectrum. The staff also noted that the GIP-2 reference spectrum is clearly outdated, using data from events only up to 1984. These ground motion estimates may have been judged to be adequate for the mid-80s, when the reference spectrum was created. However, much better estimates can be calculated using current attenuation relationships, which are based on very large and more complete strong-motion databases. Further, there are seismic recordings at several industrial sites from recent earthquakes (e.g., Loma Prieta, Northridge, Kobe, Taiwan) that could be used to update the BS and RS and to develop equipment capacity spectra for each of the 20 equipment classes. The staff indicated that, based on the above discussion, the use of the GIP-2 bounding spectrum is not appropriate for the non-USI A-46 plants. The staff also expressed its concern about the use of GIP-2 Method B.1 for the comparison of seismic demand to seismic capacity in post-USI A-46 plants. The main issue with the use of Method B.1 is that it compares

the GIP-2 RS to the building's in-structure response spectra and RS may overestimate equipment capacity since it is the upper bound of the earthquake experience database's ground motion.

The fourth item relates to the applicability of Method A in GIP-2 to equipment qualification at non-USI A-46 plants. The NRC staff noted several problems with the implementation of Method A for USI A-46 plants and indicated that the use of this method is not necessary for non-USI A-46 plants since these newer plants have available calculated in-structure response spectra. The in-structure response spectra for non-USI A-46 plants are part of their licensing basis, which the staff considers to be substantially more reliable for estimating the seismic demand for plant structures than those specified on the basis of using Method A in GIP-2. SEQUAL noted that one Farley unit is a USI A-46 plant while the other unit is among the population of non-USI A-46 plants. SEQUAL also questioned the apparent inconsistency in the requirements for qualification of similar new and replacement equipment (NARE) for each unit. The staff pointed out that there are several multi-unit sites with units of different ages and different licensing bases. However, the staff believes that in 1972, with the issuance of 10 CFR Part 100, a conscious decision was made by the Commission that the seismic capacity of newer plants needed to be more rigorously determined to reflect more current technology. The staff indicated that a review of an experientially-based seismic qualification methodology would likely require a review of the database of equipment that experienced seismically-induced ground motion.

The fifth agenda item involves the relationship of GIP-2 equipment classes to a program for equipment qualification. The staff stated its preference that, in developing an experience-based methodology for seismic qualification of equipment, each class of equipment should have its own unique seismic capacity spectrum. The staff also stated that GIP-2 definitions of equipment classes are too broad for use in an experience-based seismic qualification methodology that would be expected to provide results equivalent to qualification by testing or dynamic analyses, as currently required by 10 CFR Part 100. The staff is concerned that the GIP-2 equipment bounding spectrum may overestimate the seismic capacity of unique equipment configurations that are included within the GIP-2 equipment classes. The staff emphasized that classes should not be based solely on equipment function since the equipment may be dynamically different. The class groupings should also consider physical characteristics such as dimensions, weight, vibration frequency, mounting configuration, etc. SEQUAL indicated that the GIP-2 caveats and inclusion rules are adequate for limiting the specific range of items in a class.

The sixth item focuses on the "Rule of the Box" in equipment qualification. The staff indicated that the rule of the box, as described in GIP-2, is not acceptable for seismic equipment qualification since it does not consider the subassemblies and devices within the box. This ignores the likelihood that the subassemblies/devices in the experience database box may be considerably different from the subassemblies and devices in the qualification candidate equipment box. SEQUAL stated that its NARE process addresses new and replacement parts and subcomponents by demonstrating that host equipment meets GIP-2 with new/replacement parts installed. The NRC staff indicated that this is not part of GIP-2 and would likely require staff review and approval of the methodology used, if it were to be applied to non-USI A-46 plants for seismic qualification purposes.

The seventh item involves the use of the GIP-2 seismic adequacy methodology for applications involving seismic qualification. The staff stated that it needs as precise information as is possible, perhaps in a separate topical report, to demonstrate that use of experiential data for seismic qualification is equivalent to 10 CFR Part 100. Use of GIP-2 does not provide the same level of confidence as Part 100 does regarding the ability of components to function during and after a safe shutdown earthquake. The NRC staff suggested that SEQUAL may wish to prepare and submit a proposed approach to equipment qualification using experience-based concepts and formally request a staff review consistent with the provisions of 10 CFR Part 170.

Mr. Philips, representing Winston and Strawn, stated that his understanding is that the NRC staff had agreed, in concept, that experience may be used to meet 10 CFR Part 100. The NRC staff indicated that, if the technical issues discussed during the meeting can be satisfactorily resolved, an experience-based approach may be appropriate to demonstrate conformance with 10 CFR Part 100. The staff further indicated that use of experience data may lend itself to a risk-informed approach to meeting Part 100 special treatment provisions.

Plans for a future meeting on this subject were not discussed.

/RA/

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Enclosures: 1. Attendance List
2. Meeting Agenda
3. SEQUAL Handout

cc w/enclosures: See next page

Distribution: See next page

Document Title: G:\PDII-2\SQUG\sequal meet summary 3-20-00 (MEB Final).wpd

OFFICE	PDII-2/PM	PDII-2/LA	EMEB/BC	PDI/D
NAME	RHernan	BClayton BAC	Elmbro ED	EAdensam
DATE	5/ /00	5/25/00	5/25/0	5/25/00

OFFICIAL RECORD COPY

The seventh item involves the use of the GIP-2 seismic adequacy methodology for applications involving seismic qualification. The staff stated that it needs as precise information as is possible, perhaps in a separate topical report, to demonstrate that use of experiential data for seismic qualification is equivalent to 10 CFR Part 100. Use of GIP-2 does not provide the same level of confidence as Part 100 does regarding the ability of components to function during and after a safe shutdown earthquake. The NRC staff suggested that SEQUAL may wish to prepare and submit a proposed approach to equipment qualification using experience-based concepts and formally request a staff review consistent with the provisions of 10 CFR Part 170.

Mr. Philips, representing Winston and Strawn, stated that his understanding is that the NRC staff had agreed, in concept, that experience may be used to meet 10 CFR Part 100. The NRC staff indicated that, if the technical issues discussed during the meeting can be satisfactorily resolved, an experience-based approach may be appropriate to demonstrate conformance with 10 CFR Part 100. The staff further indicated that use of experience data may lend itself to a risk-informed approach to meeting Part 100 special treatment provisions.

Plans for a future meeting on this subject were not discussed.

Ronald W. Hernan

Ronald W. Hernan, Senior Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Enclosures: 1. Attendance List
2. Meeting Agenda
3. SEQUAL Handout

cc w/enclosures: See next page

DISTRIBUTION:

E-Mail
R. Hernan
R. Wessman
E. Imbro
P. Y. Chen
K. Manoly
C. Munson
R. Rothman
OGC
ACRS
J. Zwolinski/S. Black
E. Adensam
R. Correia
B. Clayton

Mr. James Fisicaro, Duke Energy Co.
jjfisica@duke-energy.com

cc: Mr. Neil P. Smith, Chairman
Seismic Qualification Utility Group
c/o MPR Associates, Inc.
320 King Street
Alexandria, Virginia 22314

Mr. R. Kassawara
EPRI Program Manager
3412 Hillview Avenue
P.O. Box 10412
Palo Alto, CA 94304

NRC MEETING WITH SEQUAL OWNERS GROUP ON
USI-A-46 RESOLUTION FOR NON-A-46 PLANTS

MARCH 20, 2000

ATTENDANCE SHEET

Name	Affiliation	Phone No.
Ronald Hernan	NRC/NRR	301-415-2010
Bob Rothman	NRC/DE	301-415-3306
Pei-Ying Chen	NRC/DE	301-415-2789
Cliff Munson	NRC/NRR/DE	301-415-2529
Paul Baughman	EQE	603-778-1144
Gene Imbro	NRC/DE/EMEB	301-415-2951
Kamal Manoly	NRC/DE	301-415-2765
Dick Wessman	NRC/DE	301-415-3287
Greg Hardy	EQE	714-734-4242
John Richards	Duke Power	704-382-3916
Dave Freed	MPR	703-519-0200
Jim Fisicaro	Duke Energy	704-382-1578
Malcolm Philips	Winston & Strawn	202-371-5729
Richard G. Stark	MPR	703-519-0200
Greg Ferguson	Entergy	504-739-6538

ENCLOSURE 1

SEQUAL AGENDA TOPICS FOR MARCH 20, 2000 MEETING

1. Treatment of concurrent functional and accident-induced loads, as required by 10 CFR Part 100, for Safe Shutdown Earthquake.

2. Assuring equipment functionality during Operating Basis Earthquake in combination with normal operating loads.

3. Use of GIP-2 bounding spectrum to represent equipment capacity in seismic qualification approaches.

4. Applicability of Method "A" in GIP-2 to equipment qualification at Non-A-46 Plants.

5. Relationship of GIP-2 equipment classes to a program for equipment qualification.

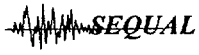
6. Use of the "Rule of the Box" in equipment qualification.

7. Use of GIP-2 seismic adequacy methodology for applications involving seismic qualification.

ENCLOSURE 2

Use of the GIP Method for Equipment Seismic Qualification in Non-A46 Plants

SEQUAL Owner's Group Meeting with USNRC
Rockville, MD
March 20, 2000



1 03/20/2000

Agenda

- Opening Remarks (E. Imbro, USNRC)
- Opening Remarks/Purpose of this Meeting (J. Fisicaro, Duke)
- Agenda Topics:
  1. Treatment of concurrent functional and accident-induced loads, as required by 10 CFR Part 100, for SSE
  2. Assuring equipment functionality during OBE in combination with normal operating loads
  3. Use of GIP-2 bounding spectrum to represent equipment capacity for seismic qualification approaches
  4. Applicability of GIP-2 Method "A" to equipment qualification at Non-A46 plants
  5. Relationship of GIP-2 equipment classes to an equipment qualification program
  6. Use of GIP-2 seismic adequacy methodology for seismic qualification
  7. Use of GIP-2 for qualification of new/replacement parts (address Rule of the Box)
- Future Plans

SEQUAL

2 03/20/2000

SEQUAL's Perspective

- The GIP methodology is a proven, technically-acceptable engineering method for demonstrating seismic adequacy.
- The NRC has judged that the GIP method meets GDC-2 and the intent of all other applicable regulations.
- Utilities have considerable technical, schedular and cost incentives to adopt the GIP/NARE methodology for all operating plants
- Adoption of the GIP/NARE method is consistent with risk-informed/performance-based principles.
- The GIP/NARE method for A-46 plants provides for an adequate level of safety.
- The same level of safety should be applied to non-A-46 plants.

SEQUAL

3 03/20/2000

Developments Since 9/17/99 Meeting

- NRC to develop a white paper which provides for NRC review of SEQUAL proposal.
- NRC agrees that the use of an experience-based approach meets regulatory (rule) requirements.

SEQUAL

Purpose of Meeting

- Discuss topics from the NRC meeting agenda.

SEQUAL

Concurrent Accident Induced Loads
Operation During the Earthquake
Concurrent Normal Operating Loads

SEQUAL

Concurrent Accident-Induced Loads

- Not covered by GIP
- Must be addressed on a case-by-case basis
- Licensing submittal to address this item as stated in plant's licensing basis

SEQUAL

Operation During the Earthquake and Concurrent Normal Operating Loads

- Covered by GIP

  "There may be equipment or components which are required to function during the strong ground motion part of an SSE. In these cases, functional capability of the equipment must be established.

  "On the basis of the seismic experience data gathered to date, the only concern that remains on equipment functional capability is chatter of electrical relays."

  NUREG-1211 (1987), Page 11

SEQUAL

8 03/20/2000

Operation During the Earthquake and Concurrent Normal Operating Loads

- From review of earthquake data SSRAP concluded:

  "Other than for the exception of relay chatter, functionality during strong shaking has been demonstrated."

  - Senior Seismic Review and Advisory Panel (SSRAP) Report

SEQUAL

9 03/20/2000

Operation During the Earthquake and Concurrent Normal Operating Loads

- SSRAP conclusion addressed all GIP classes
- Basis was:
  - Much equipment operated during earthquake
  - Other equipment successfully started and operated following earthquake
  - Examination of equipment physical structure showed equipment would have operated during earthquake
- Since GIP covers operation during earthquake, it also covers normal operating loads concurrent with earthquake

SEQUAL

10 03/20/2000

Operation During the Earthquake and Concurrent Normal Operating Loads

Operating Basis Earthquake

- Concern is equipment failure during safe shutdown earthquake due to partial damage from prior lower level earthquake(s)
- Database equipment normally experienced fore and after shocks in addition to major earthquake
- Some database equipment experienced more than one major earthquake
- GIP caveats preclude low cycle fatigue damage (brittle components, flexibility of attached lines, cabinet-to-cabinet impact)

SEQUAL

11 03/20/2000

Method A for SEQUAL

SEQUAL

14 03/19/2000

Method A for SEQUAL

- Method A is part of GIP method for NARE at USI A-46 plants
- SEQUAL Plant ISRS can be just as conservative as USI A-46 plants
- As such, Method A is a key element of the GIP approach for non-A46 (SEQUAL) plants
- Method A for SEQUAL will be technically justified on a floor-by-floor basis (same as NARE approach for USI A-46 plants)

SEQUAL

15 03/20/2000

Method A for SEQUAL

- GIP Procedure covers all elements of Seismic Qualification Process
  - Addresses both capacity and demand
  - Balanced level of conservatism in the process
- Method A lessons-learned from USI A-46
  - Only applied for situations <40' above grade and equipment with frequencies >8 Hz
  - Control point location and shallow soil considerations are important to correct application of Method A
  - Demonstration that realistic/median response is about 1.5 (e.g., SQUG RAI response justification on a floor-by-floor basis)

SEQUAL

Method A for SEQUAL

- Seismic Response Conservatisms for SEQUAL plants are similar to A-46 plants
- Farley Plant is a classic case
  - Farley Unit 1 = A-46 Plant
  - Farley Unit 2 = Non A-46 Plant
  - Same Site, Soil Profile, Structures
  - Seismic Response is Identical
  - Not technically sound to require NARE applications for Unit 1 to be substantially different than that for Unit 2
- Significant Conservatisms Exist for Newer Plants
  - Diablo Canyon (2.3 Design to Median Margin)
  - Comanche Peak (2.53 Design to Median Margin)
  - Unnamed Newer Plant (5.4 Design to Median Margin)

SEQUAL

Comparison of Design Basis to Median-Centered (Peak Spectral Response Comparison)

Plant	Building	Construction	Estimated Frequency	Comments	Damping**	Design Basis Analysis Peak S_a	Median Centered Peak S_a	Margin Design/ Median	Ground Spectra
A[1]	Auxiliary Building	5 Story, Reinforced Concrete Shear Wall	7-8 Hz	Rock Site	2%	3.8g	1.5g (Figure 1)	2.53	0.12g Reg Guide 1.60
B	Reactor Building Interior Structure	Reinforced Concrete Shear Wall	10-13 Hz	Rock/Soil	5%	5.8g*	1.1g (Figure 3)	5.3	0.12g Site Specific
B	Reactor Building Exterior Shell	Reinforced Concrete Shear Wall	4 Hz 12 Hz	Rock/Soil	5%	2.2g*	0.67g (Figure 6)	3.3	0.12g Site Specific
C[2]	Containment Interior Structure	Reinforced Concrete Shear Wall	10 Hz	Rock Site	5%	10.7g	4.7g (Figure 7)	2.3	0.75g Hosgri
D	Auxiliary Building	Reinforced Concrete Shear Wall	10 Hz	Rock/Soil	5%	1.4g	0.26g[3] (Figure 9)	5.4	0.1g Modified Newmark

* SSE defined as 2 x OBE for this Plant's Design Basis.

** Equipment damping value applies both to design basis ISRS and median-centered ISRS.

1 Plant A is Comanche Peak, information is on the NRC Docket.

2 Plant C is Diablo Canyon, information is on the NRC Docket. It should be noted that the reanalysis for the 0.75g Hosgri earthquake was done relative recently, and had less inherent conservatism in the design basis response analysis than older plants such as Ginna. Thus, the margin of 2.3 (design peak/median peak) is judged to be on the lower side of the margins expected for older plants.

3 Median Value was scaled to reflect the fact that the median ISRS were generated for a Reg Guide 1.60 shape (conservative), instead of the Plant D Design SSE.

Method A for SEQUAL

- Methods of Seismic Demand Determination
  - ➢ Plant Licensing Basis
  - ➢ Standard Review Plan
  - ➢ Median-Centered Response Analysis
  - ➢ Method A

SEQUAL

19 03/20/2000

Method A for SEQUAL

- Median-Centered Response Analysis
  - Conservatism in Median-Centered method inherent in the safety factors for:
    - Definition of Input (84% NEP Shape)
    - Capacity Definition (Reference Spectrum)
    - Bump up 1.5 factor for Median Spectra (Anchorage, GERS)
- Method A
  - Agree to meet USI A-46 level of justification for Method A (RAI's)
  - Conservative ISRS scaled by 3.77, or
  - Median-Centered type data showing ≤1.5 amplification
  - Scaling some buildings based on data on other buildings

SEQUAL

20 03/20/2000

GIP Equipment Classes

SEQUAL

GIP Equipment Classes

- Equipment grouped into classes by:
  - Physical Structure
  - Construction Standards
  - Method of Operation
  - Operating Parameters
  - Required Function
  - Failure Mechanisms
- Class ranges (inclusion rules) and included sub-classes based on earthquake reconnaissance, expert (SSRAP) judgment of equipment behavior, and past experience from seismic testing and analysis

SEQUAL

GIP Equipment Classes

- Caveats established to prevent possible failure modes not covered by inclusion rules
- Class definitions broader than what would be based solely on electronic database
  - ➢ Use of other information
  - ➢ Caveats
  - ➢ Expert peer review (SSRAP)
- Inclusion rules and caveats can be:
  - ➢ Class specific
  - ➢ Sub-class specific
  - ➢ Make and model specific

SEQUAL

GIP Equipment Classes

What Database was Used to Develop the GIP Class Ranges?

- The Earthquake Experience Database consists of thousands of equipment items in hundreds of facilities which have experienced earthquakes
- A large quantity of this data has been compiled in summary form in earthquake reconnaissance reports, journal papers, news articles, etc.
- EQE collected and catalogued detailed information for SQUG on a subset of equipment at a subset of facilities
- SSRAP and NRC participated in early earthquake reconnaissance surveys
- Later reconnaissance focused on recording failure data, not success data
- The 20 Classes Report summarizes this data
- The actual data is filed in reference library

SEQUAL

Use of GIP-2 Seismic Adequacy Method for Seismic Qualification

SEQUAL

25 03/19/2000

Use of GIP-2 seismic adequacy method for seismic qualification

What is the issue?

- GIP is a method for verifying the seismic adequacy of installed equipment for resolution of USI A46.
- How can GIP be used for seismic qualification of equipment not yet installed in safety-related systems?

SEQUAL

26 03/20/2000

Use of GIP-2 seismic adequacy method for seismic qualification

GIP + NARE Guidelines => SEQ Method

- GIP by itself is not a seismic equipment qualification (SEQ) method
- However, guidelines have been developed which provide a road map for applying GIP for SEQ of new and replacement equipment (NARE) including:
  - Which sections of GIP apply,
  - Preparation of procurement and installation specs to meet inclusion and exclusion rules (caveats),
  - Post-installation equipment walkdown to check anchorage and seismic interaction, and
  - Design difference evaluation

SEQUAL

27 03/20/2000

Use of GIP-2 seismic adequacy method for seismic qualification

Which GIP sections apply to NARE?

- Basic ground rules (Part I, Section 2.3.4)
- Personnel qualification and training (Part II, Sections 2.1.2, 2.4)
- Capacity vs. Demand evaluation (Part II, Section 4)
- Equipment class rules (caveats) (Part II, Section 4 & Appendix B)
- Equipment anchorage (Part II, Section 4 & Appendix C)
- Seismic interaction (Part II, Section 4 & Appendix D)
- Relay capacity vs. demand (Part II, Section 6.5)
- Tanks and Heat Exchangers (Part II, Section 7)
- Cable and Conduit Raceways (Part II, Section 8)
- Documentation (Part II, Sections 4, 6, 7, 8, & Appendix G)

SEQUAL

28 03/20/2000

Use of GIP-2 seismic adequacy method for seismic qualification

NARE STEPS FOR EQUIPMENT

Equipment Specification, Selection, and Procurement
- Capacity screening
- Equipment class inclusion/caveat screening
- Evaluation of later vintage equipment to establish representation in equipment class*
- Anchorage and load path specifications
- Seismic interaction specification

↓

Equipment Installation
- Anchorage inspection
- Interaction inspection

↓

Documentation

SEQUAL

Use of GIP-2 seismic adequacy method for seismic qualification

NRC Staff Position on use of the GIP for NARE in SSER-2

"Section 2.3.4 of Part I describes the criteria and procedures for future modification and for new and replacement equipment. The staff position is that these criteria and procedures may be applied to new and replacement equipment on a case-by-case (i.e., plant-specific and equipment-specific) basis only and with the provisions that the seismic evaluations are performed in a systematic and controlled manner so as to ensure that new or replacement items of equipment are properly represented in the earthquake experience or generic testing equipment classes, and that applicable caveats are met. In particular, each new or replacement item of equipment and parts must be evaluated for any design changes that could reduce its seismic capacity from that reflected by the earthquake experience or generic testing equipment classes, and these evaluations must be documented."

[SSER No. 2, Section I.2.3.4]
(underline added for emphasis)

SEQUAL

Use of GIP-2 seismic adequacy method for seismic qualification

GIP + NARE Guidelines Meets NRC Position in SSER-2

- Applied case-by-case (plant-specific, location-specific, and equipment-specific)
- Applied in a systematic and controlled manner
- Equipment evaluated for:
  - ➢ Representation in GIP equipment classes
  - ➢ Compliance to Caveats
  - ➢ Design difference evaluation
- Documented evaluation

SEQUAL

Use of GIP-2 seismic adequacy method for seismic qualification

Conclusion:

GIP + NARE Guidelines + SSER No. 2 => SEQ Method

SEQUAL

Use of the GIP/NARE Method for Parts

SEQUAL

Use of the GIP/NARE Method for Parts

- Use of GIP method for new and replacement equipment (NARE) **includes** specific procedure for evaluation of new and replacement parts and subcomponents
- GIP method for equipment involves demonstrating that the host equipment meets GIP requirements with the new or replacement part or subcomponent installed in it

SEQUAL

Use of the GIP/NARE Method for Parts

Rule of the Box

"For equipment included in Classes 1 through 20, all the components mounted on or in this equipment are considered to be part of the equipment and do not have to be evaluated separately . . .

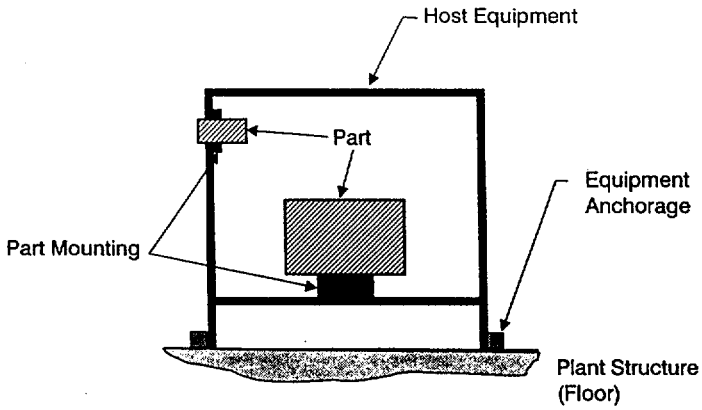
"if a major item of equipment is shown to be seismically adequate using the guidelines in this procedure, then all of the parts and components mounted on or in that item of equipment are also considered seismically adequate." [GIP, Section 3.3.3]

"Relays (chatter sensitive devices) require separate evaluation."

SEQUAL

35 03/20/2000

Use of the GIP/NARE Method for Parts



SEQUAL

36 03/20/2000

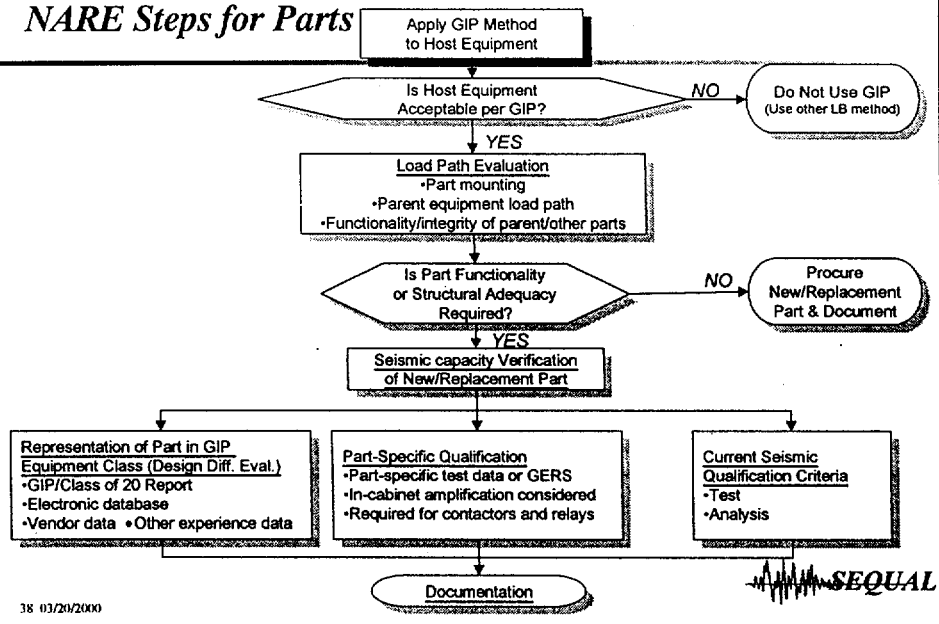
Use of the GIP/NARE Method for Parts

- NARE process addresses new and replacement parts and subcomponents by demonstrating that host equipment meets the GIP with new/replacement installed. Steps include:
  - Applying GIP method to host equipment
  - Inclusion rule for part
  - Part mounting and load path will remain intact
  - Part will not degrade safety function of parent
  - If function of new part required for host to meet safety functions, then perform separate, documented evaluation of part

SEQUAL

37 03/20/2000

NARE Steps for Parts



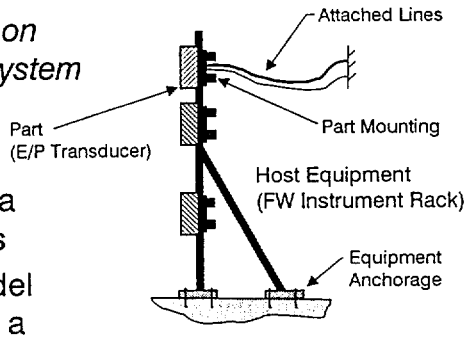
SEQUAL

38 03/20/2000

Use of the GIP/NARE Method for Parts

Example:

Electro-Pneumatic (E/P) Transducer Replacement on Feedwater (FW) Control System Instrument Rack



- Instrument rack contains a dozen typical I&C devices
- Replacing a Foxboro Model E69F E/P transducer with a Fisher Controls Type 546

SEQUAL

Use of the GIP/NARE Method for Parts

- First, confirm that existing rack (host w/ old part) is seismically adequate per the GIP
  - GIP Equipment Class= Instrument Racks
  - Old Part= Foxboro E69F , New Part= Fisher Controls 546
  - Mounting to Rack is set of four 3/8" bolts to backing plate
  - Instrument Rack is welded to baseplate, bolted to floor
  - Evaluation
    - Inclusion Rules and Caveats Met for Rack
    - Capacity of Host exceeds Demand
    - Anchorage calculation and evaluation passes
    - No seismic interaction concerns, or other concerns
  - **Therefore, host with existing part is seismically adequate prior to installation of replacement part**

SEQUAL

Use of the GIP/NARE Method for Parts

- Host Evaluation with New Part
  - New part is Fisher Controls 546
  - Old and new parts weigh about the same, no significant impact on rack weight or natural frequency
  - Replacement mounting/load path okay from host evaluation
  - Mounting identical except moved 2" left in rack
  - Connecting lines have sufficient slack for this change

SEQUAL

41 03/20/2000

Use of the GIP/NARE Method for Parts

- Part Evaluation
  - E/P transducers are addressed in Class of 20 report in two classes: Instrument Racks and Air Operated Valves
  - This design of E/P transducer is well represented in Class of 20.
    - Electronic database confirms many examples.
    - Single instance of damage (unanchored tank liftoff) not applicable to this case.
  - Function not required during SSE; part must survive and operate afterwards
  - Is not, and does not contain a chatter sensitive device.

SEQUAL

42 03/20/2000

Use of the GIP/NARE Method for Parts

- Host with New Part passes GIP + NARE evaluation
  - Prepare replacement specification (Fisher Controls 546)
  - Procure new part
  - Install
  - Check installation
  - Documentation
    - SEWS Form for host, with back up evaluations
    - NARE Guidelines checklist for new/replacement part
- Host (instrument rack) continues to meet GIP after replacement

SEQUAL

Use of the GIP/NARE Method for Parts

Conclusion

- Like GIP for A-46, GIP + NARE Guidelines address parts and subcomponents
- GIP + NARE Guidelines address seismic qualification of new and replacement **parts** with separate procedure and checklists
- Process consists of demonstrating that host equipment meets GIP requirements with new/replacement part installed
- Process is equivalent to application of GIP to same equipment without new/replacement part

SEQUAL

Tennessee Valley Authority

SEQUOYAH NUCLEAR PLANT

cc:
Mr. J. A. Scalice
Chief Nuclear Officer and
Executive Vice President
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, Tennessee 37402-2801

Mr. Karl W. Singer, Senior Vice President
Nuclear Operations
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Jack A. Bailey
Vice President
Engineering & Technical Services
Tennessee Valley Authority
6A Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Masoud Bajestani
Site Vice President
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

General Counsel
Tennessee Valley Authority
ET 10H
400 West Summit Hill Drive
Knoxville, TN 37902

Mr. N. C. Kazanas, General Manager
Nuclear Assurance
Tennessee Valley Authority
5M Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Mark J. Burzynski, Manager
Nuclear Licensing
Tennessee Valley Authority
4X Blue Ridge
1101 Market Street
Chattanooga, TN 37402-2801

Mr. Pedro Salas, Manager
Licensing and Industry Affairs
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Mr. D. L. Koehl, Plant Manager
Sequoyah Nuclear Plant
Tennessee Valley Authority
P.O. Box 2000
Soddy Daisy, TN 37379

Mr. Russell A. Gibbs
Senior Resident Inspector
Sequoyah Nuclear Plant
U.S. Nuclear Regulatory Commission
2600 Igou Ferry Road
Soddy Daisy, TN 37379

Mr. Lawrence E. Nanney, Director
Division of Radiological Health
Dept. of Environment & Conservation
Third Floor, L and C Annex
401 Church Street
Nashville, TN 37243-1532

County Executive
Hamilton County Courthouse
Chattanooga, TN 37402-2801

Ms. Ann Harris
305 Pickel Road
Ten Mile, TN 37880