August 24, 2000

Mr. Gregory Ferguson, Chairman
Seismic Experience-Based Qualification
Owners Group
Waterford 3 SES
17265 River Road
Killona, LA 70066

Dear Mr. Ferguson:

On March 20, 2000, representatives of the U.S. Nuclear Regulatory Commission (NRC) staff met with members of the Seismic Experienced-Based Qualification (SEQUAL) Owners Group at NRC Headquarters in Rockville, Maryland. The purpose of this meeting was to discuss SEQUAL's proposed use of the Unresolved Safety Issue (USI) A-46 resolution document, Generic Implementation Procedure, Revision 2 (GIP-2), for the qualification of equipment in nuclear power plants that are not included in the scope of USI A-46. This letter is to inform you of the issues that the staff has identified with respect to the use of GIP-2 for the seismic qualification of equipment in post-USI A-46 plants and to indicate the criteria that the staff will use to judge the acceptability of the SEQUAL proposal regarding the use of experiential data for seismic qualification of equipment.

The GIP-2 methodology was specifically developed by the Seismic Qualification Utility Group (SQUG) 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. Each of the nuclear power plants within the scope of GL 87-02 received a construction permit prior to the promulgation of Title 10 Code of Federal Regulations Part 100 (Part 100). The methodology employed in GIP-2 was adopted for the resolution of USI A-46 because it provided a reasonable means to verify, in-situ, the seismic adequacy of mechanical and electrical equipment installations in lieu of rigorously establishing their seismic qualification using the analysis and testing methods required by Part 100.

The intent of USI A-46 and GL 87-02 was to verify and improve, where appropriate, the seismic adequacy of mechanical and electrical equipment in plants that were licensed before the Part 100 criteria were developed. Since regulatory impact analyses did not support bringing older plants into full compliance with the requirements of Part 100, an approach (GIP-2) with less stringent requirements was adopted for USI A-46 implementation. Therefore, GIP-2 was developed to improve the seismic capability of pre-Part 100 plants. However, the GIP-2 methodology was not developed with the intent to reduce the seismic ruggedness of newer plants built with more robust seismic designs. Furthermore, the GIP-2 methodology has never been subject to a regulatory assessment for that purpose.

GIP-2 relies primarily on the use of plant walkdowns and the SQUG earthquake experience data base to verify the seismic adequacy of equipment necessary to bring a plant to hot shutdown within 72 hours following a safe shutdown earthquake (SSE). SEQUAL is proposing the use of GIP-2 as an equipment qualification procedure for new and replacement equipment

at the plants licensed to Part 100. NRC staff accepts, in concept, that the use of earthquake experiential data for seismic qualification is permissible in the context of Part 100; however, the staff has several concerns about the adequacy of GIP-2 as a method to use experiential data for seismic equipment qualification, as indicated in the attachment to this letter. In view of the staff's concerns, the proposed use of the GIP-2 criteria and processes for all equipment in post-USI A-46 plants would be a significant relaxation from the original level of seismic ruggedness that is currently required for equipment in these plants, and is unacceptable in its present form as a method for complying with 10 CFR 100.

While the NRC staff has technical issues with the use of the GIP-2 methodology for seismic qualification, the staff recognizes that properly applied and controlled experiential seismic data, utilizing current methods for estimating seismic ground motions at a particular site of interest, may be a viable method for seismic qualification of equipment. If SEQUAL decides to pursue the use of experiential data for seismic equipment qualification, SEQUAL must demonstrate to the staff that the approach and methodology selected by SEQUAL will maintain acceptable levels of safety and seismic design margins consistent with10 CFR 100 for affected equipment in non-A-46 plants. This should be done quantitatively to the extent practical. If SEQUAL believes that the Part 100 seismic design margins constitute an unnecessary regulatory burden, it may petition for rulemaking in accordance with 10CFR Part 2.802. Alternatively, SEQUAL, could pursue a risk-informed approach for seismic qualification of equipment using experiential data following the guidance in Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis." Unfortunately, the staff cannot expend any additional resources on the utilization of an experientially-based seismic qualification methodology for post-USI A-46 plants prior to the formal submittal of a qualification methodology for staff review and approval.

Please contact me (301-415-1274) or Gene Imbro (301-415-3288) of my staff, if you have any questions.

/S/

Brian W. Sheron, Associate Director
for Project Licensing and Technical Analysis
Office of Nuclear Reactor Regulation

Attachment: As stated

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AREAS IN GIP-2 THAT WOULD CONTRIBUTE TO REDUCTION
IN THE SEISMIC DESIGN MARGIN FOR EQUIPMENT QUALIFIED
TO THE REQUIREMENTS IN PART 100 TO 10 CFR

- Section VI of Part 100 requires 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. Concurrent functional and accident-induced loads are not considered when using the GIP-2 process.

- The GIP-2 reference spectrum (RS) is outdated, using ground motion data from events only through 1985, and limited in scope since only four response spectra were used for its creation. Furthermore, based on current seismic engineering techniques, two of the four ground motion estimates used to develop the RS (Sylmar Converter Station and Pleasant Valley Pumping Plant) are not appropriate estimates of the ground motion at these facilities. In particular, the ground motion estimate for the Sylmar Converter Station from the 1971 San Fernando earthquake is from the Paicoma Dam recording of the San Fernando earthquake scaled to a peak ground acceleration of 0.5 g. Also, the ground motion estimate for the Pleasant Valley Pumping Plant from the 1983 Coalinga earthquake is from the switchyard instrument located approximately 69-feet above plant grade. These ground motion estimates may have been judged to be adequate for the mid-80s, when the RS was created; however, it is clear that much better estimates of ground motion at the database sites can be calculated using current seismic engineering techniques such as those outlined in the SQUG document dated February 17, 2000, “SQUG Procedure for Gathering and Validating Earthquake Experience Data.”

- The assumption made in GIP-2 that the in-structure response spectra (IRS) (seismic demand) at all elevations within 40-feet above the plant’s grade are identical to the ground response spectrum is a generalization that is not technically justified for post-USI A-46 plants, since these newer plants have available calculated IRS. IRS for post-USI A-46 plants were developed using state-of-the-art analytical techniques and assumptions that are in general agreement with the Standard Review Plan (SRP). These IRS are part of the licensing basis for post-USI A-46 plants, which the staff considers to be substantially more reliable for estimating the seismic demand for plant structures than those specified on the basis of the alternative method in GIP-2.

- The GIP-2 definitions of equipment classes are too broad for use in an experience-based seismic qualification methodology that would be expected to provide a level of confidence comparable to that established from seismic qualification by testing or dynamic analyses, which is currently required by Part 100. The equipment classes should not be based solely on equipment function, since equipment with the same function may be dynamically very different. Instead, the class groupings should also consider appropriate physical characteristics such as dimensions, weight, vibration frequency, and mounting configuration.

- In developing an experienced-based methodology for seismic qualification of equipment, each class of equipment should have its own unique seismic capacity spectrum rather than a single generic spectrum for all types of equipment, as is done using the GIP-2 RS. Each class of equipment should be sufficiently populated to provide reasonable assurance that the equipment in the class will function during and after an earthquake.

Attachment

A unique seismic capacity spectrum for each equipment class is now possible, since there are a large number of industrial sites in the SQUG Electronic Earthquake Experience Database.

- Explicit evaluations of subassemblies within an item of equipment are not required by GIP-2. Without appropriate justification, this is not acceptable for seismic equipment qualification, since it ignores the likelihood that the subassemblies/devices in the experience database item may be considerably different from the subassemblies and devices in the qualification candidate equipment.

- GIP-2 is not written as a seismic qualification document but rather as a guide for successfully addressing USI A-46 implementation. It, also, contains significant amounts of material extraneous to the seismic qualification of equipment.

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Brian W. Sheron, Associate Director
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