

Welcome to the second SQUG Newsletter of 2009. There continues to be a lot of action in the seismic world. Several significant earthquakes have occurred, we continue routine support for our operating plants, and new plant activities are ongoing. We hope you find this brief update on SQUG and other seismic related activities informative and useful.

John Richards
SQUG Chairman

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Recent Earthquakes



In just 35 days the Asian / South Pacific region experienced six earthquakes of M7 or greater, including one M7.8 and one M8.0. Three of those six earthquakes were on the same day just 41 miles apart. Debates continue about the potential interactions between these events but for the most part, it appears they were unrelated events.

Here is a brief description of these six earthquakes as well as a few other significant earthquakes in the second half of 2009

We'll review all of the significant 2009 earthquakes at the Winter meeting in December.

Southern Sumatra

The most significant earthquake in the second half of the year was the M7.6

earthquake on September 30 in Southern Sumatra.

At least 1,100 people were killed, over 2,000 injured, and thousands more are still unaccounted for. The New York Times reported that nearly every building over three stories in Padang suffered damage from the initial quake, which hit just 30 miles away, and the city's three main hospitals all collapsed.

Samoa Islands

On day before the earthquake in Southern Sumatra, a M8.0 earthquake struck on September 29 near the Samoan Islands. This off shore earthquake caused a tsunami approximately 10 ft tall, leading to more than 190 deaths and significant damage in Pago Pago, American Samoa, and in many parts of Samoa and on Niuaotupapu, Tonga.

Torres Islands & Vanuatu

Three very large earthquakes occurred on October 7th within about 1 hour and 65 miles of each other in the South Pacific near the Torres Islands (about 1,200 miles east of Australia).

At 9:03 am local time, a M7.6 earthquake occurred in the South Pacific off the Santa Cruz Islands. Fifteen minutes later, a M7.8 earthquake occurred about 65 miles away. Then at 10:13am local time, a M7.3 earthquake occurred about 27 miles from the first earthquake. Fortunately all three of these very large earthquakes were far enough



Padang Sumatra Island Shopping Mall



Tsunami in Pago Pago American Samoa

from land that they did not cause significant damage. Also, unlike the Samoan earthquake 8 days before, none of these earthquakes caused a tsunami.

According to the USGS, all three events are likely related. "While the first two similarly sized events may be considered an earthquake doublet, preliminary analysis suggests the 10:13 am event is likely a large aftershock of the previous events."

Ongoing Earthquake Investigations

We are continuing to investigate the October 2006 earthquake in Hawaii, and the July 2007 earthquake near the Kashiwazaki-Kariwa nuclear plant in Japan.

The Hawaii earthquake investigation was initially delayed by local legal questions, but, those disputes are resolved and we are working with the Hawaiian utilities to investigate lessons learned and to collect equipment performance data. Site visits were completed at 5 power facilities the first week of November and a draft report should be available by the end of the year. We'll provide a more detailed update at the Winter meeting.

Our investigation activities of the Niigataken Chuetsu-oki earthquake near the Kashiwazaki-Kariwa (KK) nuclear plant have consisted of supporting TEPCO's restart activities and participation in the IAEA EBP.

TEPCO was **very pleased** to restart Units 6 and 7 earlier this year and they are continuing to perform evaluations necessary to restart the remaining units. Congratulations are truly in order for TEPCO's hard work in reaching this milestone

SQUG is working with TEPCO to assemble an equipment list, that can

then be used to appropriately focus further data collection.

SQUG Training

In September, a Seismic Capability Engineer (SCE) Walkdown course was hosted by Électricité de France in Lyon. Eighteen students from EdF attended along with four additional students from SQUG members or their contractors. The course was very well received and the students were pleased with the course content and administration.

Special thanks goes to Paul Baughman who led the course and Sebastien Ravet who supported Paul and took care of all of the logistics necessary to make the course a success.

Updated G-STERI Evaluations

EPRI published an update of the G-STERI Evaluations on September 30, 2009 in report 1016694, Generic Seismic Technical Evaluations of Replacement Items for Nuclear Power Plants – Item-Specific Evaluations: TR-105849. An additional report describing the technical basis for the updates was published in 1016691,

Periodic Review of G-STERI Evaluations.

The June 2009 Newsletter provided a summary of the more important G-STERI changes.

We have been reviewing the updates to see if there are any impacts on the GIP classes or equipment GERS. Many of the G-STERI changes were due to high-level seismic test results, so there does not appear to be any impacts on the GIP class definitions or capacities. We are conducting a review of the equipment GERS, which offer higher test-based capacities for narrower equipment classes. The reviews could conclude that there are no adverse impacts, or that some adjustments are necessary to the GERS capacities, inclusion rules or caveats, or that adjustments to the NARE design difference guidance would be appropriate.

We'll provide an interim update of the evaluations at the Winter meeting along with a plan to complete the reviews.

Reg. Guide 1.100 Rev 3

The NRC issued Regulatory Guide 1.100 Rev 3 in September 2009



Seismic Capability Engineer Training at EdF in Lyon

endorsing IEEE 344-2004 and ASME QME-1-2007 for seismic qualification of equipment. You may recall that one of the primary changes to both IEEE 344 and ASME QME was to incorporate earthquake and test experience-based seismic qualification methods.

In the end, the NRC decided that *“The use of experience data (earthquake or test experience data) for the seismic qualification of electrical equipment is subject to review by the NRC staff.”* RG1.100 goes on to suggest that Topical Reports may be submitted to the NRC for approval so that the staff can review items *“such as*

- (1) the credibility and completeness of the compilation of the experience database,*
- (2) the inclusion and exclusion rules (termed “prohibited features” in IEEE Std. 344-2004) for electrical equipment in the experience database,*
- (3) the justification used to demonstrate the similarity among the member items in a reference equipment class,*
- (4) the justification used to demonstrate the similarity between electrical equipment in the experience database and equipment in the NPP for seismic qualification purposes, and*
- (5) the justification used to demonstrate the functionality of candidate equipment and the member items in a reference equipment class during and after an earthquake.”*

The IEEE 344 Working Group plans on asking for additional guidance regarding this review process.

Unfortunately, RG 1.100 establishes two very different review and acceptance practices for seismic qualification.. If you do qualification using the traditional testing, analysis, or one-to-one similarity methods per IEEE 344-04, you don't need

supplemental NRC approval. On the other hand, if you do qualification using the earthquake or test experience-based methods in IEEE 344-04, you'll need to submit a Topical Report and seek NRC approval first.

A number of years ago the SEQUAL group submitted a Topical Report with the hopes of receiving NRC approval for using earthquake experience-based qualification methods at non-USI-A-46 plants. Between April 2001 and April 2003 the NRC and SEQUAL met and exchanged information in support of the review but the NRC declined to approve the Topical Report.

After some discussion in the Steering Group meetings, it is difficult to see how another Topical Report supporting general acceptance of SQUG like equipment classes would be more likely to succeed. Therefore, we will continue to focus our resources on supporting SQUG

member application of the GIP for evaluating existing equipment as well as New and Replacement Equipment.

IAEA EBP on Seismic Safety of NPPs



The IAEA Extra Budgetary Project (EBP) on “Seismic Safety of Existing NPPs” has completed its second year of operation. Ken Huffman of EPRI attended the annual Steering Committee meeting in October and received updates on the second year's activities and the third year's.

One of the projects under way in the EBP is a review of OBE exceedance and automatic SCRAM criteria. Included in the proposal is the use of earthquake experience data to study various seismic Damage Indicator Parameters (CAV, Fourier Descriptor, Power Spectral Density, etc.) to see if there is a better parameter or perhaps a higher acceleration or CAV threshold that could be justified. The

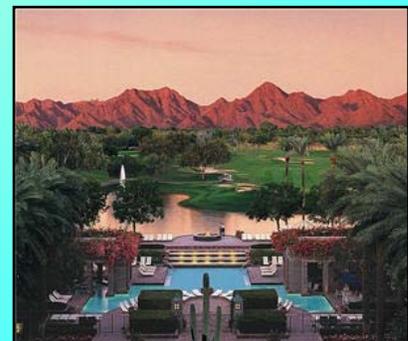
2009 SQUG Winter Meeting

The 2009 SQUG Winter meeting is coming up on December 2, 3, and 4 at the Hyatt Gainey Ranch in Scottsdale, Arizona.

You should have received an e-mail invitation from EPRI or directly from Bob Kassawara with links to confirm your attendance as well as instructions for making your hotel reservations. Click [here](#) to see the ERPI reservation page. The meeting will start at 1:00 pm on Wednesday the 2nd and end at noon on Friday the 4th. If you need any information about the meeting, please contact Bob Kassawara.

At the meeting you'll receive updates on our activities, have a chance to network with your peers, and guide the organization to best meet your needs.

If you will be attending the meeting, please come prepared to discuss seismic issues at your plant(s). For several years now we have invited attendees to mention current seismic issues at their plants. It is a terrific way to learn more about your peers, stimulate discussions, and identify potential SQUG support opportunities.

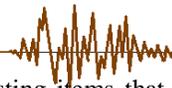


SQUG earthquake experience data and the Japanese nuclear plant data are expected to be the best sources of information.

Direct access to the SQUG data would be limited to EBP SQUG members or SQUG contractors although the study results would probably be published as a public document. This appears to be a nice combination of IAEA EBP and SQUG resources, with appropriate access controls, that has the potential to develop beneficial results.

We'll review this project as well as other ongoing EPB activities at the upcoming Winter meeting.

This and That



Here are a few interesting items that don't quite warrant a separate Newsletter article but might be worth mentioning.

Updated Training Material

The Reference CD that goes along with the SQUG Walkdown training was updated in May to make a few minor corrections, including the student Pre-Test. If you are planning to hold a course at your utility, you should get the latest training material from EPRI (1007683, Rev 4.2) at www.epri.com.

Updated Piping Report

The SQUG Experience-Based Seismic Verification Guidelines for Piping Systems was updated in September to include test data on various pipe fittings (threaded, soldered copper, and Swagelok). The updated two-volume report is EPRI 1019199 and is available at www.epri.com.

HVAC Units in Hospitals

I was at Trentec a few weeks ago to witness SQRSTS seismic testing. It was interesting to see that the test lab was full of hospital HVAC units

being seismically tested in accordance with commercial requirements.

IEEE 344 -20??

The IEEE 344 Working Group is just getting started on the path to the next revision. If you want to help you can contact the Working Group Chair Jim Parello at parellj@westinghouse.com. One issue the Working Group will need to figure out is a rigid range cutoff for new plants that is 100 Hz rather than the traditional 33 Hz.

Civil Engineers at L'Aquila

The latest issue of Civil Engineering magazine has an interesting article about the kinds of lessons you can learn from earthquake investigations. While most of the buildings behaved well enough to allow the occupants to exit safely, one team member asked if that performance goal was really meeting society's needs. You might want to check it out by clicking [here](#).

New Plant Margins

There continues to be a variety of new plant seismic issues being discussed. The most recent question is the new plant commitment to achieve a Seismic Margin of 1.67. Part of the difficulty is getting a whole new collection of people up to speed with the methods. Lurking down the road is the commitment to have a Seismic PRA one year before fuel load.

PSHA Inputs

As we have noted before, a broad host of experts is developing an update of the Central and Eastern U.S. (CEUS) seismic source characterization. The source characterization is a key input to Probabilistic Seismic Hazard Analyses (PSHA) describing the kinds of earthquake motions that are expected to happen in various CEUS regions. This update is expected to hit the streets in about a year or so.

The other key PSHA input are the attenuation models, which predict how the seismic motions travel from

the earthquake sources to any selected location, typically a nuclear power plant site. A separate team of experts is working on an update to the CEUS attenuation models. This study should finish about 2 years or so after the seismic source characterization update.

By the time we get to the end of these two studies, we should have a fairly stable set of CEUS inputs for PSHAs. In the mean time, we'll be working through these kinds of seismic hazard impacts through GI-199 for the existing fleet and through conservative sensitivity studies for the new plant applications.

In Closing



As always, we hope this Newsletter helps keep you up to date on our SQUG activities and other significant seismic issues. If you have any comments, thoughts, or contributions for the Newsletters please let us know.

We look forward to seeing you at the Winter meeting in Scottsdale and we hope everyone has an enjoyable and safe holiday season!



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