

Welcome to the first SQUG Newsletter of 2010. The beginning of the year was a particularly active time for big earthquakes. This tends to reinforce the value we bring in the nuclear seismic qualification world, while at the same time demonstrating the need for good commercial and residential building codes and strong application of those codes.

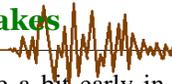
We hope you enjoy this brief update on our SQUG activities as well as the broader nuclear power seismic qualification world.

John Richards, SQUG Chairman

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Recent Earthquakes



The world shook quite a bit early in the year. Through mid August, there were 40 earthquakes above M6.0 with 17 of those above M7.0 and one of those at M8.8. This isn't that far from historical averages but what was unusual was that a greater portion of the larger earthquakes were in more populated areas.

Haiti

On January 12th, a M7.0 earthquake struck in Haiti 15 miles from Port-au-Prince. The combination of a large earthquake in a highly populated area with great poverty and poor building practices led to tragic consequences. From official estimates, 222,570 people were killed, 300,000 were injured, and 1.3 million were

displaced. Seven months later the tragic affects of the earthquake continue.

One of the more insightful articles on the earthquake damage is available on the [BBC website](#). It was called "Why did so many people die in Haiti's quake?" and compared the M7.9 earthquake on May 12 2008 in Sichuan, China with the M6.3 earthquake in L'Aquila, Italy and the M7.0 earthquake in Haiti.

As engineers we know that earthquake magnitude is a log scale that measures the energy released by the earthquake. We also understand that there are a number of parameters that go into the ultimate impact of the earthquake. Figure 1 below compares the energy released by the three earthquakes. Figure 2 below

compares the deaths/1,000 residents for each earthquake. The BBC article does a very nice job of describing in simple terms how the way we design and construct our world plays such a critical part in determining the earthquake's impacts.

The Earthquake Engineering Research Institute (EERI) has a very good [website](#) dedicated to this earthquake. The Pacific Earthquake Engineering Research Center (PEER) also has a [website](#) dedicated to this earthquake.

The PEER website includes a presentation that discussed

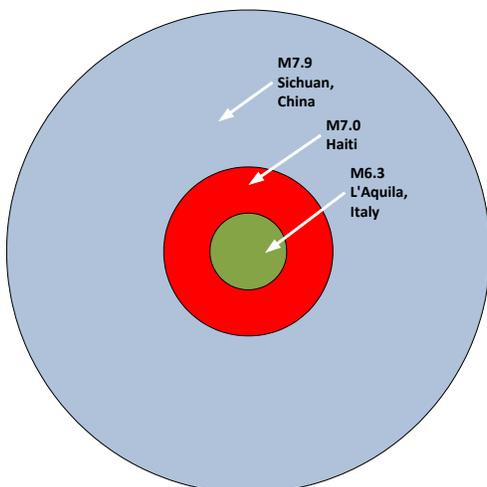


Figure 1: Comparison of released energy

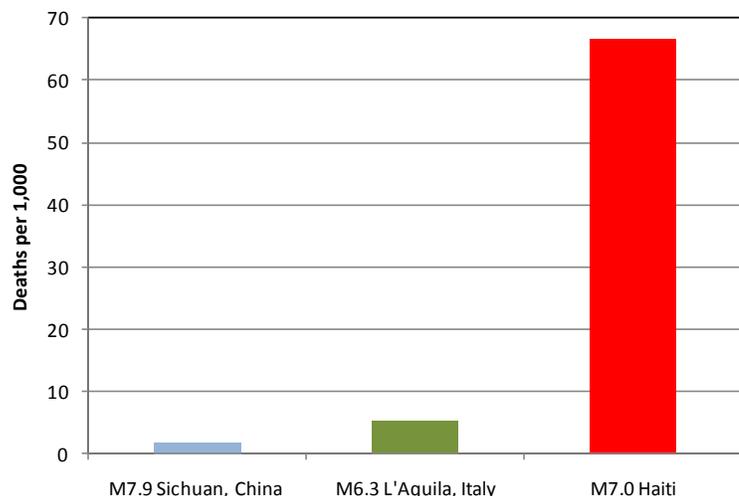


Figure 2: Comparison of deaths per 1,000 residents

infrastructure performance, including power plants. Equipment failures tended to be dominated by anchorage failures, or interaction problems.

Chile

The next big earthquake early in the year was a M8.8 earthquake just off the coast of Chile. The February 27th earthquake caused peak ground accelerations (PGAs) of 0.15g to 0.25g over significant coastal regions with some areas peaking as high as 0.35g. Over 550 people were killed, and 800,000 displaced. At least 370,000 houses, 4,000 schools, 75 hospitals, and 4,200 boats were damaged or destroyed by the earthquake and tsunami in the Valparaiso-Concepcion-Temuco area.

Baja California, Mexico

The upper peninsula of Baja Mexico was hit by a M7.2 earthquake on April 4th. There were PGAs on the order of 0.4g along a southeast to northwest line from the Gulf of California up towards Mexicali Mexico and El Centro California. The region is sparsely populated, which limited the impact on people and commerce.

Southern Qinghai, China

Nine days later on April 13th, a M6.9 earthquake occurred in central China. The shaking was very intense over a small area, focusing the impacts (2,200 deaths and 12,000 injured) in a limited region.

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 investigation is wrapping up. Six power stations with high accelerations were including power plants, substations, and wind farms.

A draft report will be reviewed by the Steering Group as well as the Hawaii Electric Light Company (HELCO). The final report will be completed later this year.

Moving further west, a data collection visit was made to the Kashiwazaki-Kariwa plant in March to better understand the TEPCO damage reports and to collect a representative sample of success data in Units 1 and 7. We expect to collect data on about 600 pieces of equipment for each of the two units.

The quality of the data collected at KK is considerably more detailed than a typical earthquake investigation at a commercial facility. We have site specific and in-structure earthquake recordings as well as specific equipment descriptions and performance records. This represents a terrific opportunity, but it will also require some special considerations for using this data with the existing eSQUG data.

We owe special thanks to HELCO and TEPCO for their support and coordination of these investigations!

Seismic Training

In July you should have received an e-mail announcement for a session of the one-week Walkdown Seismic Capability Engineer (SCE) training course. The course was held at the

Westinghouse Energy Center in Monroeville, PA, a suburb of Pittsburgh from August 23 to 27. A photo showing most of the 34 students who attended the course is shown below.

Several of you have also asked about the other seismic qualification training developed by the EPRI SQUG and SQRSTS groups that covers a more general introduction to equipment seismic qualification in accordance with IEEE 344 seismic testing and analysis. I am pleased to say that EPRI Plant Support Engineering (PSE) is making plans to offer a session early next year. If you are interested, you should contact Charlie Mengers at 484-497-8767 or cmengers@epri.com.

Updated G-STERI Evaluations

We have been reviewing the updated G-STERI Evaluations (EPRI reports 1016691 and 1016694) to see if there are any impacts on the GIP classes or equipment GERS. This information is being treated consistent with how we would evaluate new earthquake experience data to determine if the new information indicates that changes would be necessary to the SQUG equipment capacities.

From our review, the G-STERI changes were due to anomalies in high-level seismic tests; therefore,

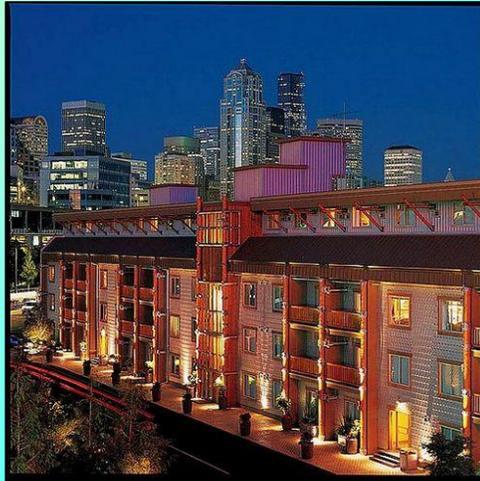


Figure 3: SQUG Walkdown SCE Training Class, August 23-27, 2010

2010 SQUG Winter Meeting

The 2010 SQUG Winter meeting will be held December 1, 2, and 3 at the Edgewater Hotel in Seattle WA. The meeting will start at 1:00 pm on Wednesday the 1st and end at noon on Friday the 3rd.

An official meeting invitation with more information was sent by the “EPRI Events” system on July 7th to SQUG reps, alternates, and licensing folks. If you did not receive this notice and wish to register for the meeting please call or e-mail Bob Kassawara at EPRI. We hope you’ll be able to join us to receive updates on our activities, network with your peers, and help steer the organization to best meet your needs.



there are no impacts on the earthquake-experience based class definitions or capacities.

We have been conducting a review of the equipment GERS, which offer higher test-based capacities for narrower equipment classes. The following items were determined to require a more detailed evaluation of the G-STERI information and the GERS capacities.

- DIN Rail mounted devices
- Thermal overload bimetallic relays
- Analog indicating meters
- Position switches
- Manual disconnect switches
- Transmitters (mounting)
- Solenoid operated valves

At this point, it does not appear that the test data that led to the G-STERI changes conflict with the existing GERS. The Steering Group is reviewing a draft report evaluating each item above. The final report

should be available by the end of the year.

European SQUG Meetings

Robert Kassawara, Greg Hardy, and Paul Baughman worked for months to organize meetings in the UK, Sweden, and France with European SQUG members. Unfortunately, they didn’t account for an Icelandic volcano in their plans.

With some efforts, they were able to hold 2 of the 3 scheduled meetings. The initial agenda for these meetings was dominated by issues discussed at last December’s membership meeting, but the discussions included far ranging issues from application of the GIP, to updates to the database, ongoing European research, and improved communication and coordination with European SQUG members.

The Steering Group will be considering a number of ideas

discussed in those meetings for future research.

A SQUG Survey

We’re planning to conduct a member survey on SQUG and equipment seismic qualification practices. It will allow members to offer suggestions in specific areas and to learn how their efforts compare with their peers. Please watch for it in your e-mail and complete it promptly. The results will be discussed in the upcoming Winter meeting. Note that a similar survey, conducted five years ago, provided some interesting benchmarking information. These two surveys should offer an interesting view of the evolving equipment seismic qualification world.

This and That

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

Rod Hanger Supports

ASCE 7 TC-8, Subcommittee on Seismic Requirements of Non-Structural Components is considering the establishment of seismic design rules for rod hangers including fatigue. In support of those efforts, Steve Eder requested that we release NP 7152-D, “Seismic Evaluation of Rod Hanger Supports for Electrical Raceway Systems” as a public document. The Steering Group agreed and advised EPRI to release the report, which it did earlier this year.

GI-199 Update

GI-199 is an NRC initiative that deals with the implication of updated seismic hazard curves and uniform hazard spectra on existing nuclear plants in the Central and Eastern US. The NRC staff has been evaluating this issue for a while, and has

discussed and compared methodology and results with EPRI.

Changes Are Coming

After 10 years as SQUG Chairman, I am moving on. I have some new work assignments and I just can't do justice to the job now so ... I am resigning as SQUG Chairman.

My time with SQUG brought me wonderful opportunities to do interesting work with a terrific group of people. I have been able to travel the world representing the group, standing on the shoulders of all of you who created and effectively implemented the experience-based seismic qualification method. It has been a great pleasure.

Divakar Bhargava of Dominion Generation has agreed to be the next SQUG Chairman. He brings years of seismic and SQUG experience and it is good to know that you will be in good hands.

The Steering Group has also agreed to add Rusty Childs from Duke's Oconee Nuclear Station to the Steering Group. Rusty was a key leader in Oconee's SQUG implementation and continues to be responsible for maintaining the SQUG evaluations through plant mods and equipment replacements.

I thank you for your support through the years and I look forward to seeing you in future endeavors.

John

At a recent National Regional Utility Group meeting, an NRC manager recently identified certain plants that may not meet the screening criteria outlined in the NRC Management Directive 6.4, Generic Issues Program. The NRC expects to publicly release the Safety/Risk Assessment Report for GI-199 within the next 3-4 weeks and to hold a public meeting on this subject in late September or early October. Future actions may include an Information Notice and a possible Generic Letter may follow. More details are expected to become available in the coming months.

Seismic PRA Pilot Plant Review

A pilot Seismic PRA (SPRA) was recently completed jointly by EPRI and Dominion engineers for the Surry nuclear plant. The purpose was to test out the fairly new ASME/ANS External Event Standard and determine if changes, additions or recommendations are needed improve the effectiveness of the Standard and better reflect the current state of the art in performing SPRAs for Capability Category II under the standard. The effort yielded several useful insights and we are hopeful that the next version of the Standard will benefit from those insights. A report was published by EPRI in July 2010 (No. 1020756) and EPRI members may want to download it from EPRI's website.

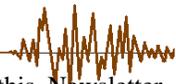
CEUS Source Characterization

An update of the Central and Eastern U.S. (CEUS) seismic source characterization for nuclear facilities is nearing completion. The update is being supported by EPRI, NRC, and DOE using the SSHAC process. It will replace the old EPRI and LLNL

seismic hazard source characterizations and will represent the latest and greatest thinking about CEUS seismicity. The process was implemented by technical experts from organizations like

BC, BYU, DNFSB, DOE, EPRI, FWLA, GT, NRC, SC, TVA, UK, UO, USGS, UT, VT as part of the TI and the PPRP¹. Most of the work has been completed and a draft report is being reviewed.

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 hope you'll plan to make it to Seattle for the Winter meeting and that you have a safe and fruitful remainder of the year!

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¹ Acronyms in this sentence (*some may not be official*): BC – Boston College, BYU – Brigham Young University, DNFSB – Defense Nuclear Safety Board, DOE – Department of Energy, EPRI – Electric Power Research Institute, FWLA – Fugro William Lettis Associates, GT – Georgia Tech, NRC – Nuclear Regulatory Commission, PPRP – Participatory Peer Review Panel, SC – Southern Company, TI – Technical Integrator, TVA – Tennessee Valley Authority, UK – University of Kentucky, UO – University of Oklahoma, USGS – United States Geologic Survey, UT – University of Tennessee, VT – Virginia Tech,