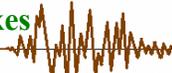


Welcome to the first SQUG/SEQUAL Newsletter of 2007. It has been a pretty busy year so far so we hope you find this brief update on SQUG/SEQUAL related activities informative and useful.

**John Richards**  
**SQUG/SEQUAL Chairman**

## Recent Earthquakes



The table below lists the “significant” earthquakes identified so far this year by the USGS. Most of them were in fairly remote areas or off shore.

Two of the earthquakes resulted in significant deaths (Southern Sumatra and the Solomon Islands) and those same two led to hundreds of injuries and significant local damage.

There are also two U.S. earthquakes noted on the list but they are relatively small. Neither one caused significant numbers of injuries or substantial damage. I suppose they are on the list because the U.S. Geologic Survey created it, and those are the most significant U.S. earthquakes so far this year.

The first was a M6.7 quake on October 16, 2006 in Hawaii. Aside from the obvious hardships of having to travel to a beautiful vacation resort in the middle of the Pacific Ocean, this event might actually offer an opportunity to collect valuable data.

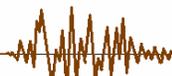
There were a number of instruments in the area and some of the recorded spectra look quite high. Preliminary calculations show several stations with spectra well above the SQUG Reference Spectrum. Initial damage reports from the area show the typical damage (unreinforced masonry, land slides, etc.) but discussions with people from the University of Hawaii and Hawaii Electric Company (HECO) suggest that we may be able to get some good success data.

It appears that we may have to wait for a few legal issues to be resolved before we can get more information, but we’re staying in touch.

The second event we’re still pretty interested in was an August 2005 M7.2 quake near the Onagawa Nuclear Plant in Japan. Obviously, a large earthquake near a nuclear plant could be a wealth of information. They reportedly have spectra recorded at numerous locations and a pretty good record of the plant response. We were already

Date	Mag.	Location	Deaths
Jan 13	M 8.1	East of the Kuril Islands	
Jan 21	M 7.5	Molucca Sea	4
Jan 30	M 6.8	West of Macquarie Island	
Jan 31	M 6.5	Kermadec Islands, New Zealand	
Mar 6	M 6.4	Southern Sumatra, Indonesia	70
Mar 25	M 6.7	Coast of Honshu, Japan	1
Mar 25	M 7.1	Vanuatu	
Apr 1	M 8.1	Solomon Islands	54
May 8	M 4.5	Western Montana	
May 9	M 5.2	Offshore Northern California	

## Not So Recent Earthquakes



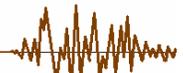
There are two older earthquakes we are still looking at to see if we can or want to collect data.

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pursuing a few paths to get this data, but it looks like we might have a better chance through an IAEA project (see details below).

## Steering Group Changes



We have a few Steering Group changes to announce. Rick Cutsinger has reached that place most of us are just dreaming about ... retirement. With the successful restart of Brown’s Ferry behind him, Rick has retired from TVA. We thank him for his many years of service to SQUG/SEQUAL and wish him all the best in retirement!

Jey Sekaran ran into difficulties when his management opted to trim business travel. Unfortunately, that included Jey’s travel to the Steering Group meetings, so he had to resign

from the group. We thank Jey for his support on the Steering Group and look forward to seeing him at the SQUG/SEQUAL annual meeting in December.

Two new members have agreed to serve on the Steering Group. Most of you know Dan Fiorello and Divakar Bhargava and we are pleased that they, and their management, have agreed to offer their support to the SQUG/SEQUAL Steering Group. Dan works for Exelon and has been an active SQUG/SEQUAL representative for many years as well as a participant in a number of other industry seismic groups. Divakar Bhargava works for Dominion and has also been an active SQUG/SEQUAL representative and participant in numerous other industry seismic activities. Both Dan and Divakar bring a wealth of seismic qualification knowledge to the Steering Group.

We are fortunate to have both of them on the Steering Group and we look forward to dumping as much work as possible into their capable hands!

## SQUG/SEQUAL Website

You should have received an e-mail announcement that the SQUG/SEQUAL Website was recently updated. It has been a little stagnate lately and the recent update includes more than a year's worth of meeting minutes, newsletters, NERP Evaluations, updated training material and various guidance documents. Check it out at <http://squgweb.mpr.com>.

Later this year the website will go through a pretty big back-end update. There will be a new server, an updated operating system, and new website software. You may not notice a lot as a user, but this will bring us into the 21<sup>st</sup> century and more

importantly, facilitate much easier and more frequent content updates.

## GIP-3A 50.59 Audited

It may not be the learning experience you want for your plant, but Peach Bottom's 50.59 to adopt the GIP was audited recently, and it turned out pretty well!

The NRC was at Peach Bottom early in the year performing an Integrated Inspection. Part of the inspection included reviewing four 50.59 evaluations, including the one to adopt GIP-3A as an acceptable qualification method.

Initially the reviewers questioned if the NRC had approved GIP-3A and suggested that Peach Bottom should have adopted GIP-2. They also said

because it was merely the compilation of previously accepted positions.

After some debate, the reviewers concluded that GIP-3A was acceptable, although they suggested that the Peach Bottom 50.59 should have included comments explaining that version 3A is a compilation of other NRC reviewed documents.

The official NRC inspection report referenced the Peach Bottom 50.59, as well as SQUG correspondence with the NRC and SQUG members and concluded with the resounding endorsement ... "No findings of significance were identified."

Congratulations to Peach Bottom Engineering for having the right information, and to the NRC reviews for accepting appropriate and reasonable positions with respect to GIP-3A and the 50.59!

## SMiRT 19

The 19<sup>th</sup> International Structural Mechanics in Reactor Technology (SMiRT) Conference will be held in August 2007 at the Fairmont Royal York hotel in Toronto, Canada. The SMiRT conference is always an interesting conference and no doubt, with the recent resurgence in potential new nuclear plants around the world, the 2007 conference will have a fair amount of information about new plant issues along with the usual array of current operating plant issues.

A number of papers on SQUG/SEQUAL and other seismic issues will be presented at the conference including a case study or two and information about the planned MCEER partnership and use of the GIP method for commercial equipment.

Check out the SMiRT website for additional information on the conference (<http://www.engr.ncsu.edu/smirt-19/>).

that the GIP isn't acceptable for qualification, only seismic verification.

Paul Kester of Peach Bottom Engineering showed the reviewers the GIP-3A correspondence between SQUG and the NRC, noting that GIP-3A was submitted to the NRC and that they opted not to review it

## Seismic Housekeeping

At the 2006 Winter meeting several utility reps noted they were dealing with seismic housekeeping issues. Potential interaction items such as scaffolds, garbage cans, test carts and drawing stick sets tend to crop up near safety related equipment. Similarly, normal plant operations require

opening enclosure doors on occasion, which can lead to seismic qualification questions.

SQUG/SEQUAL will be performing a survey of our members this summer to collect copies of station directives, procedures, or other controlling documents related to seismic housekeeping. Based on the information we receive, we will prepare a set of best practices that members can use to gauge their own controls and make improvements as necessary. I'm sure we all have some wisdom to share as well as something to learn.

## MCEER Partnership

I'm sorry to say that we're still working out the details of the MCEER agreement. We had all hoped that it would be in place by now and we would be well down the road of information exchange. Unfortunately, it is taking the lawyers a little longer than anticipated to finish an agreement that accomplishes what the engineers would like (collaborative information sharing) while keeping everyone out of trouble (things like export controls, derivative products, researcher access, fee structures, etc.). To keep everything straight, it looks

like we may end up with two separate agreements; one for the MCEER corporate partners, and one for the university researchers. We're making progress and one of these days, we'll clinch the Champagne classes.

## IAEA Seismic Study of Japanese Earthquakes

A few months ago we became aware of an interesting seismic study the Japanese are coordinating through the IAEA. In addition to the Onagawa earthquake noted above, the Japanese have had a number of large earthquakes near their nuclear plants. Some of those earthquakes caused plant shutdowns and some of the recorded ground motions approached or exceeded their S1 design levels (comparable to the Operating Basis Earthquake in the U.S.). In fact, the 2005 Onagawa earthquake was the third large earthquake near that plant since the early 1990s!

The Japanese are the primary funders of a 3-year study investigating the following four primary areas:

1. Re-evaluation of seismic hazards (Japanese site hazards and seismic hazard methodologies),
2. Re-evaluation of seismic safety for the existing plants (deterministic

and probabilistic criteria, HCLPF estimates, use of earthquake experience and testing data for SSC evaluations),

3. Post earthquake plant response (appropriate shutdown criteria, damage indicators, restart criteria), and
4. Earthquake experience database (free field and in-plant seismic records, component responses and installation details, assessment of integrity and functionality).

Obviously, SQUG/SEQUAL is very interested in that last item. In addition to the 2005 Onagawa data, this project would include data from a number of earthquakes and plants. Aside from the experience data, the U.S. nuclear industry is pretty interested in staying in touch with all of these items so there might be some modest fringe benefits too.

We have had several conversations with IAEA representatives and it appears that SQUG/SEQUAL can join the project for a modest annual fee. We're working on the details (who gets what information, who is committing to do what, how much does it cost in cash or work-in-kind, etc.) Oddly enough, it appears that this might be easier to put together than the MCEER agreement because it doesn't include turning over EPRI products. Keep your fingers crossed.

## 2007 Winter Meeting

We're in luck. Bob Kassawara was able to work out a pretty good deal for us to return to the Hyatt Gainey Ranch (<http://scotbtsdale.hyatt.com>) in Scottsdale, Arizona for our Winter meeting. Those of you who attended the 2004 Winter meeting at the same hotel know that it is a beautiful place.

Mark your calendars for the 2007 SQUG/SEQUAL Winter meeting on December 5, 6, and 7 at the Hyatt Gainey Ranch in Scottsdale, AZ. The meeting will start at 1:00pm on Wednesday the 5<sup>th</sup> and end at noon on Friday the 7<sup>th</sup>. The hotel rate is \$179/night (U.S. \$).

We'll send out an official meeting notice with additional information closer to the meeting. We hope you'll be able to join us to receive updates on our activities, network with your peers, and help us steer the organization to best meet your needs.

## Member Requested NARE Evaluations

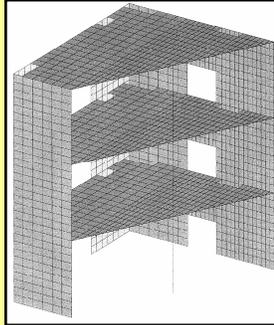
As discussed in the 2006 Winter meeting, several member requested NARE evaluations were performed in 2006. They have now been posted on the SQUG/SEQUAL website, along with a number of related process guidance documents.

If you would like SQUG/SEQUAL to help with a NARE Evaluation for

## Are you SMART?

An interesting project we heard about in Europe is Benchmark SMART 2008, which is the “**S**eismic design and best-estimate **M**ethods **A**ssessment for **R**einforced concrete buildings subjected to **T**orsion and non-linear effects.” The first thing you can learn from this project is that a long title makes it easier to come up with a good acronym.

On the more serious side, this is a study sponsored by Electricité de France (EDF) and Commissariat à l’Energie Atomique (CEEA) to study the non-linear response of 3D concrete buildings. They are inviting just about all takers to do their best estimate analysis of a 3-story eccentric concrete structure to predict displacements, stresses, and in-structure response spectra.



Then they will perform shake table testing of a ¼ scale version of the structure and see how the answers compare. No doubt this will be an interesting test of the axiom “No one believes the analysis except the analyst and everyone believes the test except the test engineer.”

You can find out more about this study at <https://www-sismique.cea.fr> (user name: SMART2008, password: emsi). Check it out!

your plant – at no extra cost to you – check out the guidance on the website and give us a call!

## International SQUG / SEQUAL Meetings

We held a series of meetings with our European members in May of this year in Manchester, Stockholm, and Lyon. These were similar to the set of meetings held in October 2003, and like those meetings, were a great opportunity to discuss seismic and SQUG/SEQUAL activities with our European members. Our European members are enthusiastic supporters of the SQUG methods and were pleased that we returned for meetings.

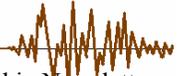
Similar to the U.S. members, the European members were very interested in SCE Walkdown Training. We were able to discuss training needs with them and as a result, will have a European SCE Walkdown Training Course in

October (see below). They are also very interested in NARE and in particular the vintage issues addressed within that process. We will probably hold a European NARE course some time in the future.

In addition to SQUG/SEQUAL issues, there were also a number of interesting discussions on items such as undercut concrete anchors, new seismic hazards, high frequency ground motions, and potential new plants. There is a lot of interest in continued seismic information sharing among all of the European SQUG members and we hope to be one of

the key vehicles to facilitate that interaction.

## SCE Walkdown Training



By the time you read this Newsletter, we will have just completed a SQUG/SEQUAL sponsored Seismic Capability Engineer (SCE) Walkdown Training at Dominion’s offices in Richmond, VA. This was a very popular class with 32 students from eight SQUG member utilities in the U.S. and Europe and 1 student from the U.S. NRC. The photos below show two groups of students performing seismic reviews of equipment in the mechanical room at Dominion’s Innsbrook Technical Center.

There will be another SCE Walkdown Training class this fall in Europe at the EdF office in Lyon France on October 8 through 12. Obviously, this class is focused on our European members, but U.S. members would be welcome if they can get their management to approve the trip!

## New Plant Seismic Issues



A plethora of tasks continues in an effort to resolve seismic issues related to new nuclear plants in the U.S.

Most of the efforts have been focused on resolving conflicts between the



higher frequency ground motions now required to be evaluated at Central and Eastern United States (CEUS) rock sites vs. the generic Regulatory Guide 1.60 input spectra used in most of the new plant designs. Initial efforts hoped to resolve the conflicts at the plant foundation level and reduce the high frequency seismic motions propagating through the buildings and into the equipment and secondary systems. Various techniques were investigated to improve the Probabilistic Seismic Hazard Assessments (PSHA), and to better account for the way higher frequency motions act upon the plant foundations. Based on industry recommendations, the NRC issued a new Regulatory Guide (RG 1.208) in March that allows the use of a performance-based method that results in lower high frequency ground motions as compared to methods in RG 1.165.

In late January, it became clear that industry's efforts would not be successful enough to avoid some equipment and secondary system evaluations.

Since then, greater efforts have been focused on the tools necessary to implement some of the high frequency reduction techniques via rock soil structure interaction (SSI) analyses (yes that's right, SSI analyses at rock sites!), and high frequency screening analyses for limited structures and potentially sensitive equipment.

It appears that we may be closing in on a collection of techniques that reduce the predicted high frequency motions and then reasonably screen the structures, systems, and components to confirm that the remaining high frequency motions are acceptable.

The industry has been working closely with the NRC for over two years. A lot of information has been submitted to the NRC for review and they have concurred with some parts of the total

resolution. Industry will be submitting the remaining studies and technical reports soon and we are hopeful that the NRC will concur with the remaining parts.

You can contact Adrian Heymer at NEI (202-739-8094, [aph@nei.org](mailto:aph@nei.org)) or Bob Kassawara for the latest information.

## G-STERI Updates

In the May 2006 Newsletter we noted that the SQRSTS organization was reviewing the G-STERI Evaluations (EPRI TR-104871) to see if any updates were warranted. You may recall that the 2005 SQUG/SEQUAL member survey identified G-STERI as the most commonly used method for seismic evaluation of replacement parts.

SQRSTS's review assessed the impact of seismic testing on generic evaluations for each of the 77 items contained in the report. Their reviews are nearing completion and have identified only minor changes for a few items. A revision of the report is expected to be issued this year, following peer review.

For additional information you can contact Rick Easterling at EPRI (704-595-2045, [rmeaster@epri.com](mailto:rmeaster@epri.com)) or Billy Goforth at Southern (205-992-6903, [brgofort@southernco.com](mailto:brgofort@southernco.com)).

## Seismic RI/PB Activities

The EPRI Structural Reliability and Integrity (SR&I) group has been involved with developing risk-informed seismic methods for a number of years. It recently sponsored a one-week training on seismic risk-informed methods (SPRA and Margins) and applications. The training was very successful and is expected to be offered again in the future.

The SR&I group is also sponsoring a pilot study to validate the Seismic PRA criteria in the recently revised ANS External Events standard ANS-58.21-2007. The pilot will consider the Capability Category II level, which may be required by the NRC in the future for risk-informed decisions involving seismic considerations. The hope is that any significant insights from the pilot will be used to guide future revisions of the ANS standard and utility seismic PRA practices.

## In Closing

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

We hope everyone has an enjoyable and safe summer!



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