

Here is the first SQUG/SEQUAL Newsletter of 2008. There is a wide variety of things happening in the seismic world from the big quake in China, to numerous interactions with the NRC, to our own work to improve the safety of our plants. We hope you find this brief update on SQUG/SEQUAL and other seismic related activities informative and useful.

John Richards
SQUG/SEQUAL Chairman

China Earthquake

On May 12, 2008, the earth shook, buildings crumbled, and thousands of people died in eastern Sichuan, China. In these moments, the realities of our jobs take on a very different



Wenchuan, the city nearest to the epicenter of the quake, had a population of 118,000. Photo: Chen Kai/Xinhua, via Reuters

heartbreak. Chinese government and international support rushed into the region to rescue and support survivors.

The earthquake occurred along the Longmenshan fault or a tectonically related fault in central China. By June 18, there were just over 230 aftershocks ranging from M3.4 to M6.0. Most of those aftershocks occurred in the first few days but aftershocks as large as M5.5

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occurred as long as 15 days after the main event.

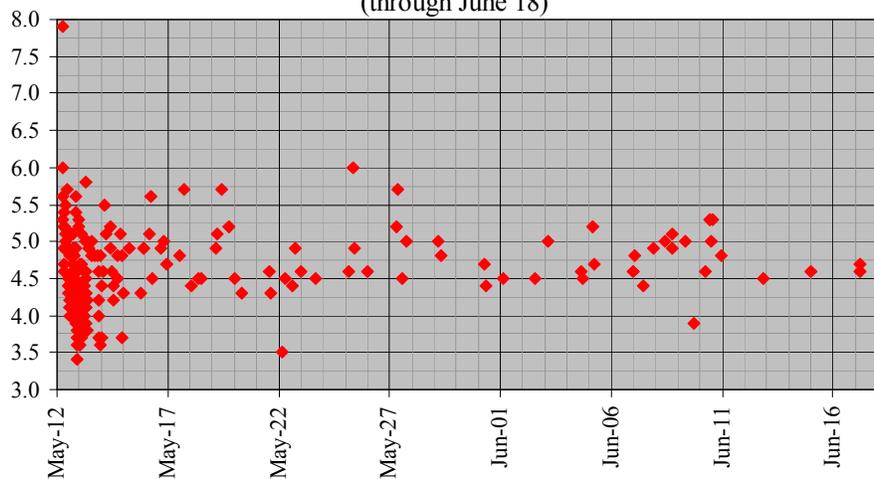
The flooding risks appeared to have eased a little and recovery efforts are still under way. Recent reports indicate that there are over 5 million

perspective. Theoretical design basis earthquakes become very real and the impacts on people become undeniable.

The M7.9 earthquake in eastern Sichuan, China caused at least 68,900 deaths and severe damage in the Dujiangyan-Mianzhu-Mianyang area. Landslides blocked roads and buried buildings in the Beichuan-Wenchuan area. Landslides also dammed rivers, leading to “quake lakes” and flooding concerns, which were subsequently exacerbated by heavy rains. The tragic collapses of numerous schools deepened the

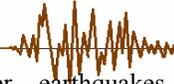
Eastern Sichuan, China Aftershocks

(through June 18)



people homeless. Significant risks still exist and it will be some time before the region returns to normal everyday life.

Other Recent Earthquakes



A number of other earthquakes occurred this year. Several of them are noted below.

Congo

On February 3rd a M5.9 earthquake occurred in the Democratic Republic of the Congo. Forty-four people were killed and hundreds more injured. Power outages occurred in about 50 percent of the city of Bukavu.

Indonesia

A M7.4 earthquake occurred on February 20, 2008 near Simeulue, Indonesia. Three people were killed and 25 seriously injured in the western Aceh province.

Nevada

A M6.0 earthquake occurred in northeastern Nevada on February 21, 2008. At least three people were injured, over twenty buildings heavily damaged, and almost seven hundred buildings slightly damaged in Wells, Nevada.

Illinois

The April 18, 2008 earthquake in Illinois was not a terribly large earthquake (M5.2) but a few buildings sustained minor structural damage at Mount Carmel and West Salem, Illinois and a cornice fell from one building in Louisville, Kentucky. Operators at several U.S. nuclear plants as far as 250 miles away reported feeling the earthquake and reported Unusual Events to the NRC. None of the plant's

instruments exceeded their trigger levels (0.01-0.02g) so there are no nuclear plant recordings available.

Greece

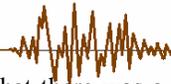
A M6.1 earthquake occurred in Greece on June 8, 2008, killing two people, injuring dozens more and damaging scores of homes.

Japan

On June 13 a M6.9 earthquake occurred in northern Japan. At least 10 people were killed and 144 injured. There was extensive damage to buildings and infrastructure in the region as well as numerous landslides.

At TEPCO's Fukushima Daini nuclear plant about 125 miles away, there were reports of water leaks from a pool in a rad waste storage warehouse (or perhaps fuel pool sloshing), however, the plant continued to operate normally.

Hawaii EQ Investigation



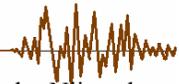
Previously, we noted that there was a M6.7 quake in October 2006 in

Hawaii. Preliminary calculations showed several recording stations with spectra well above the SQUG Reference Spectrum. We had discussions with the Hawaiian electric utilities and were waiting for potential legal issues to be resolved.

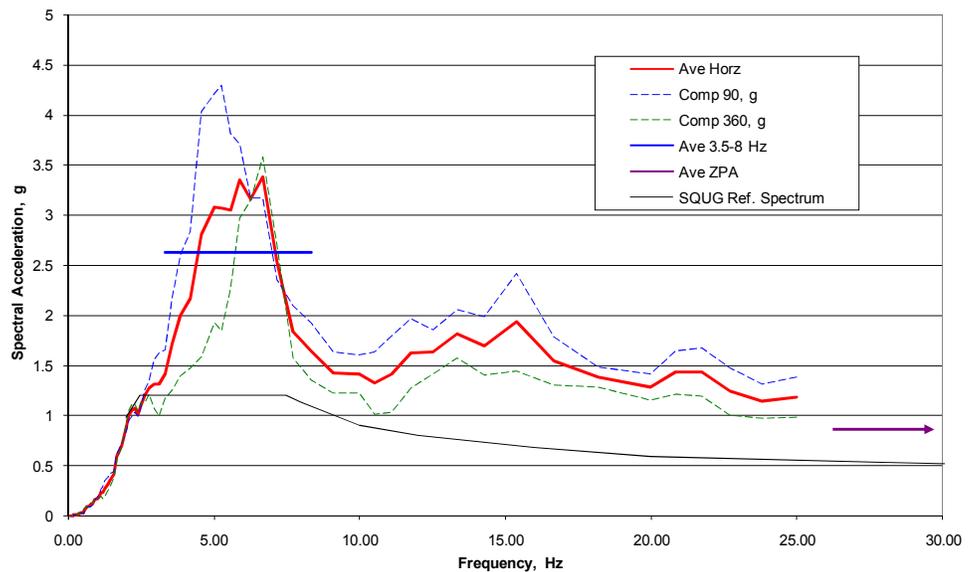
Those issues appear now to be resolved so we are getting more detailed ground motion response spectra estimates and planning site visits for the fall.

As you can see from the response spectra comparison below, the Hawaii information has the possibility of being quite valuable. If the equipment locations are relatively close to the higher amplitude recording stations, it will be terrific data.

Kashiwazaki-Kariwa Progress



Almost one year after the Niigataken Chuetsu-oki earthquake, the Kashiwazaki-Kariwa (K-K) nuclear power plant continues to make progress towards repairs and restart.



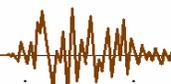
Average Horizontal Spectra at Wiamea Fire Station, Hawaii

TEPCO has reanalyzed the reactor buildings using the earthquake recordings and is defining a new design basis earthquake. The analyses performed with the recorded time histories show that the reactor building stresses were within the elastic range. Following development of the new design basis earthquake, they will perform evaluations using that input.

They are also actively communicating their findings with their regulators as well as the international engineering community and the Japanese public. You can find regular updates on their website (www.tepco.co.jp/en/index-e.html).

Future steps leading to restating the plant include completing reanalysis of the critical nuclear structures and equipment as well as repairing or replacing damaged non-nuclear portions of the plant.

SQUG Relay Evaluation Training



Duke Energy is sponsoring a session of the SQUG Relay Evaluation Training on August 20 and 21, 2008. You should have received an e-mail announcement of this course in early June.

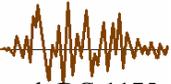
This course is intended for engineers who will perform relay evaluations using the SQUG GIP. With engineers trained in this course, SQUG member utilities can maintain the relay screening and seismic adequacy evaluations of essential relays at their USI A-46 plants.

The training will be at the MPR offices at 320 King Street, Alexandria, VA 22314. Anyone who would like to attend the class is invited to contact Rusty Childs of Duke Energy at (864) 885-4402 or rpchilds@duke-energy.com.

The cost for the course is \$1,500 and

registrations are required to be submitted by July 21. This class is not offered very often so if you need to get anyone trained, you should really consider this opportunity.

NRC DG-1175



The NRC recently issued DG-1175 with proposed revisions to RG 1.100, "Seismic Qualification of Electric and Active Mechanical Equipment and Functional Qualification of Active Mechanical Equipment for Nuclear Power Plants." This update will provide the NRC's endorsement, with exceptions and clarifications, of IEEE 344-2004 and ASME QME-1-2007.

If you have not seen the draft Reg. Guide, it is available from the NRC's website (<http://www.nrc.gov/reading-rm/doc-collections/reg-guides/power-reactors/draft-index.html>). Industry comments are due to the NRC on July 11. Several organizations are collecting comments including IEEE, ASME, and NEI.

2008 SQUG/SEQUAL Winter Meeting

Mark your calendars for the 2008 SQUG/SEQUAL Winter meeting on December 3, 4, and 5 at the Gallery One Doubletree Guest Suites Hotel in Fort Lauderdale, Fla.

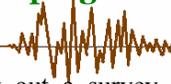
The meeting will start at 1:00 pm on Wednesday the 3rd and end at noon on Friday the 5th. The hotel rate is \$169/night (U.S. \$).

The Friday morning session will include a workshop on the HVAC Evaluation Guideline along with the usual NARE Workshop. 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 steer the organization to best meet your needs.



Seismic Housekeeping Benchmarking



Last October we sent out a survey about seismic housekeeping requirements so that we could develop a "Best Practices" guideline. The survey asked members to submit copies of their controlling documents associated with housekeeping requirements covering general housekeeping as well as controls for scaffold and guidance for working in electrical enclosures.

We received a good number of responses, and assembled the info into a draft report late last year. We had an extensive discussion about the information at the 2007 Winter meeting and the meeting attendees

offered a number of helpful suggestions.

An updated draft report was reviewed at the April Steering Group meeting. One important adjustment was made at that meeting which was to change the report from a Best Practices guideline to a Benchmarking report. There were a number of good practices but it was difficult, and not really necessary to identify Best Practices. Therefore, we decided to redefine the report as a Benchmarking report and explain the various utility practices. That way, everyone can see the variations and choose the ones that would be best for your conditions.

The report includes information in the following key areas:

- Responsibilities and Training
- Applicability
- Control of Temporary Items
- Electrical Enclosures
- Office Type Environments
- Scaffolds and Ladders

Overall the report looks good and it should be a helpful tool for members who are looking to update their seismic housekeeping criteria.

We will be distributing the current draft, along with the Steering Group comments to SQUG/SEQUAL representatives for review. Following that review cycle, the final report will be issued later this year.

IAEA Seismic Study of NPP Earthquakes

The IAEA Extra Budgetary Project (EBP) on "Seismic Safety of Existing NPPs" has progressed significantly since its kick off meeting in September 2007.

You may recall that the project has the following Working Group focus areas:

1. Re-evaluation of seismic hazards
2. Re-evaluation of seismic safety of existing nuclear plants
3. Post earthquake plant response
4. Earthquake experience database
5. Coordination with the K-K plant

SQUG/SEQUAL is most interested in the database activities, although we have some interest in all of the EBP activities.

With thanks to Jim Johnson and Paul Baughman, here are brief updates from each Working Group. I think you will see that there is a lot of intriguing working going on!

Working Group 1

Working Group 1 has had several meetings focused on developing damage indices that can be customized to NPP structures, systems, and components and are international in nature. The two primary candidates are Cumulative Absolute Velocity (CAV) and Japan Metrological Agency (JMA) Intensity with correlation between these measures. Additional efforts include reviews of the seismic hazard methodology to be implemented for Japanese NPP sites including K-K. All products are to be applicable to the international community.

Working Group 2

Working Group 2 is focused on benchmark calculations for shake table tests (e.g., the SMART 2008 test in France), and for recorded earthquake motions at the K-K plant. Jim Johnson represented SQUG at a recent meeting focusing on the data requirements for the benchmark calculations for K-K. TEPCO agreed to provide data to allow EBP participants to calculate seismic response of the reactor building, a

On the Move

Greg Hardy and Kelly Merz have moved from ARES Corporation to Simpson Gumpertz and Heger. SGH is a structural engineering company with offices in Boston, New York, Los Angeles, Washington DC, and San Francisco. Greg, Kelly, and others will be opening a new office in Newport Beach, California and will continue in their support of EPRI and SQUG/SEQUAL activities.

Greg's new e-mail address is gshardy@sgh.com and Kelly's is klmerz@sgh.com.

Their new address is:

Simpson Gumpertz and Heger
4000 MacArthur Blvd.
Suite 710
Newport Beach, CA 92660

sample piping system, and a sample equipment item.

Working Group 3

Working Group 3 is focusing on the development of international guidelines on pre-earthquake planning and post-earthquake actions at NPPs. The guidelines will borrow significantly from EPRI NP 6695 for earthquakes below the SSE. Significant development efforts will be devoted to actions required for earthquakes greater than the SSE including recommended actions to be performed right after the earthquake and shortly thereafter. Significant focus is on what needs to be done prior to restart (or other NPP disposition such as decommissioning). The resulting guidelines will be applicable internationally and may be adopted in part or in total at the option of individual countries. They are hoping to have a draft guideline for review by the EBP Steering Committee in October.

Working Group 4

Paul Baughman recently attended a Working Group 4 meeting to discuss EBP database development and data collection.

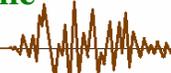
Vito Renda and Kent Mehr of JRC (an EU national lab in Italy) have been working on the database and demonstrated the database structure. They also showed how the various Working Group documents and reference document links can be entered and searched. They also discussed the status of a questionnaire to be used to solicit information from nuclear power plants that experienced earthquakes.

Paul demonstrated eSQUG to show how SQUG assembled the earthquake experience data and site spectra in an accessible and useful form. He also provided input into how to make the EBP questionnaire more explicit in soliciting information based on the attributes SQUG tries to obtain in post-earthquake data collection. The final questionnaire will be a good tool to add to SQUG's earthquake reconnaissance procedure.

The group also discussed an EBP database feature that displays nuclear power plant locations around the world using Google Earth. It can also show plants located within a given radius from an earthquake epicenter.

They discussed how to link to USGS, receive earthquake notifications, and apply a distance-magnitude screening algorithm to provide immediate notification to IAEA (and to EBP participants via the database) if an earthquake occurs near a nuclear plant. This would help the IAEA quickly contact the plant, find out what happened, and offer assistance. Vito and Kent will try to implement this feature.

New Plant Seismic Issues



The November 2007 Newsletter article on new plant seismic issues started off ... *"The generic industry research into advanced methods for reducing the high frequency ground motions is drawing to conclusion."* Well here it is the middle of 2008 and we're still hard at it. I suppose it won't be over until the license is issued, and the plant is up and running!

More recently, the issues seem to be focused on more site-specific questions although some of those issues may have generic implications.

Early reviews and questions have revealed NRC concerns about the 1989 EPRI Seismic Hazard study, post construction soils characterization, and equipment high frequency evaluations.

In response to NRC concerns, NEI and EPRI performed two seismic hazard sensitivity studies and a policy White Paper suggesting a process for such studies. The two studies involved new interpretations of the seismic hazard in the East Tennessee Seismicity Zone (ETSZ) and modeling assumptions within the 1989 EPRI study by the Dames & Moore team in the southeast.

The White Paper proposed policies that could be used to evaluate new seismic hazard information, including significance thresholds for information warranting numeric studies and impacts warranting seismic hazard updates.

It seems that the industry is going to have to find a way to achieve reasonably consistent interpretations by various seismic hazard experts on site-specific submittals. The NRC will compare each new submittal with previous submittals and everyone will get questions about any differences.

This could become an unstable process with the likely result being that everyone will be moved towards the most conservative positions. Hopefully we can avoid taking the process in this direction.

Early submittals are receiving a number of soils related questions. Some of these are related to settlement and seismic response analyses for safety-related and non-safety-related buildings. Other questions are related to testing of installed soil backfills to confirm that they comply with the licensing basis documents and seismic analyses.

On a different subject, the NRC issued an updated Interim Staff Guidance (ISG) in May on "Seismic Issues Associated with High Frequency Ground Motion." This ISG documents the Staff's position on a number of issues as supplemental guidance to their Standard Review Plan (NUREG-0800).

In many cases, the new plant issues are challenging because they are first time evolutions using new methods and regulatory policies. With that in mind, solutions may not be complete until the plants are licensed, built, and operating.

You can contact Leslie Kass of NEI at (202-739-8115, lck@nei.org) or Bob Kassawara for the latest information.

GI-199



In 2005, the NRC identified Generic Issue 199, "Effect of New Seismic Hazard Results on Existing NPP in CEUS." In 2007, the NRC completed a screening analysis for GI-199 and decided that it "warrants further analysis under the Generic Issue Program (GIP)." On the other hand, they also concluded that "there does not appear to be an issue that requires immediate action to protect public health and safety."

In a public meeting on February 6, 2008, the NRC described the background and their proposed risk-informed evaluation process. Their general plan is to do a safety assessment focused on the plants that show the highest seismic CDFs (or lowest seismic margins) and use a figure of merit based on the change in seismic CDF.

NEI and EPRI are working on an industry screening review to determine potential plant-specific significance. Those efforts are currently focused on estimating updated site-specific seismic hazards at the existing CEUS plant sites. There have been some delays due to limited resources and competing work on new plant evaluations but updates are expected to be completed this summer.

As these results become available you may hear from the project coordinator, Alex Marion at NEI (202-739-8080, am@nei.org)

New Seismic Hazard Studies

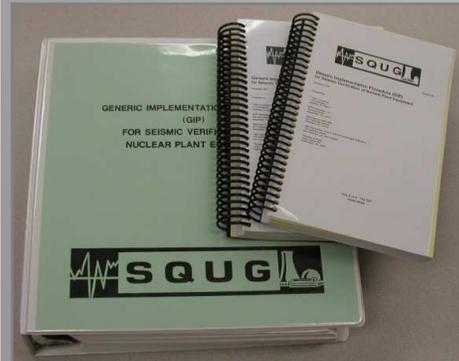
Just as all of the new plant COL applications are being review, and the NRC is considering seismic hazard impacts in GI-199, there are two additional seismic hazard studies underway.

EPRI and DOE are sponsoring an update to the EPRI seismic source characterization. This study is intended to replace the seismic sources in the 1989 EPRI Seismic Hazards. It will also include NRC participation and the goal is to develop one, agreed upon model of

Mini GIPs

Have you ever gotten tired of hauling around the GIP? Apparently Dick Starck has because he made mini copies for a training class a year or so ago.

Well, now you can have one too. Bob Kassawara has a number of spiral bound mini GIPs available for SQUG members.



Full size and Mini GIPs

If you'd like one, just have your company's SQUG Rep contact Bob to request a copy. The SQUG Reps should also let Bob know if they'd like any extra copies for distribution within their company.

seismic source characterizations for the CEUS in approximately 2 to 3 years.

At the same time, the NRC, USGS, Pacific Earthquake Engineering Research Center (PEER), and others are sponsoring a project called Next Generation Attenuation (NGA) East with the goal of updating the CEUS attenuation model. It will also include EPRI and other industry participation so that they achieve one, agreed upon attenuation model for the CEUS in the next 4 to 5 years.

As these two scientific studies progress, we will need to work closely with the NRC to maintain regulatory stability.

G-STERI Updates

In the May 2006 and June 2007 Newsletters we noted that the SQRSTS organization was reviewing the G-STERI Evaluations (EPRI TR-104871) to see if any updates were warranted. They recently completed

their work, and developed proposed revisions.

Highlights of the proposed G-STERI update include the following:

- Revised 37 of 76 G-STERI evaluations
- Added new restrictions to approximately 14 of the existing evaluations based on test data from 1997 to the present
- Proposed one new G-STERI evaluation for DIN rail mounted items

SQRSTS asked for peer reviews by SQUG/SEQUAL and the Joint Utility Task Group (JUTG). Those reviews are underway and should be returned to SQRSTS in

time for their summer meeting in late June.

The revised G-STERI report and supplemental report are expected to be published by the end of this year.

For additional information, contact Rick Easterling at EPRI (704-595-2045, measter@epri.com) or Billy Goforth at Southern Co. (205-992-6903, brgofort@southernco.com).

Surry S-PRA Pilot

ANSI/ANS Standard 58-21-2007 provides a methodology for conducting probabilistic risk assessments (PRAs) for external events (primarily seismic). The EPRI Structural Reliability & Integrity (SR&I) Working Group is sponsoring a trial plant seismic PRA review using the Surry Plant to try out the new Standard and identify if any changes should be recommended.

Work began last year and the following tasks have been completed.

- New seismic hazard curves and SSE ground spectra have been computed in accordance with RG 1.208.
- The Surry safe shutdown equipment list has been reviewed.
- Plant walk-downs have been conducted.

Ongoing and future tasks include:

- In-structure response spectra for two structures are being calculated for the new SSE using soil-structure interaction.
- Fragilities of equipment and structures will then be computed.
- System analyses and sequence-quantification will follow to generate the seismic core-damage frequency (CDF).

The project is being performed jointly between Dominion and EPRI and is scheduled for completion by October

2009. It is expected to provide recommendations for revisions to the current ANS Standard and for a future ASME higher level risk standard.

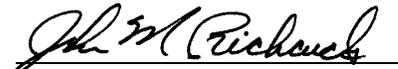
Revision 2 to RG 1.200 endorsing the current ANS Standard is expected to be issued by the end of this year and will have technical guidance on conducting seismic PRAs. Although seismic PRAs are not a regulatory requirement, many U.S. utilities are expected to perform such PRAs or upgrade previous seismic PRAs for their plants over the next several years as they see potential benefits.

In Closing

As always, we hope this Newsletter helps keep you up to date on our SQUG/SEQUAL activities and other significant seismic issues around the industry and around the world. 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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