

Chairman's Message

Welcome to the first SQUG Newsletter of 2012. The past year has been one of the most active on record. The tsunami caused by the M9 Tohoku earthquake on March 11, 2011, less than 250 miles from Tokyo, Japan was devastating and we extend our deepest sympathies to those impacted by the tragic events. The damage at the Fukushima Dai-ichi nuclear plant complex was unprecedented. The Japanese government raised the severity rating of the accident at this power station to seven, the worst on a scale set by the international Atomic Energy Agency and equal to the Chernobyl accident of 1986. The recovery efforts at Fukushima Dai-ichi will continue for some time.

Significant actions are being taken worldwide as a result of the Fukushima event. In the US, operating nuclear plants responded to INPO Event Reports in the months following the accident. In June 2011, EPRI, INPO and NEI established a Fukushima Steering Committee to coordinate the response of the US nuclear industry to the events in Japan. In July 2011, USNRC's Near Term Task Force (NTTF) on the Fukushima accident recommended changes to defense-in-depth measures in several areas. In the seismic area, NTTF recommendations 2.1 and 2.3 (described in this newsletter) resulted in draft 50.54(f) letters (request for information) in January followed by updated versions in SECY-12-0025 in February, with the final letters expected in early March. NEI, working with the industry Seismic Task Force and EPRI is providing response to the NRC on both draft letters. The US nuclear industry will be working closely with the NRC and we expect to see more interactions and substantial effort from plant owners in the coming months and years.

Then, on August 23, 2011, a M5.8 earthquake struck Central Virginia, with its epicenter 11 miles southwest of the North Anna Nuclear Power Station. Both units automatically shut down on negative flux rate. The response spectra developed from the recorded motions at the containment basemat showed that the earthquake exceeded the plant's design basis spectra; however, the effective strong motion durations and energy content of the earthquake were small. Thus, there was only minor damage to a few non-safety structures and systems. After thorough inspections, analyses, surveillance and functional tests, extensive NRC reviews and requests and four public meetings, both units were back on line in less than three months after the event. From my own intense involvement, the restart success story was possible not only because the earthquake was non-damaging, but also due to the tenacity and hard work of owner Dominion's engineers and management, support from EPRI and others in the industry, and a fully committed NRC staff. The lessons learned from this earthquake are already beginning to take shape on many fronts: seismic monitoring instrumentation, review of the industry's post earthquake procedures/guidance and implications for seismic hazard models for the Central and Eastern US.

These events put into perspective the value of the work we do in seismic design/qualification of nuclear plant equipment. In addition to our day-to-day work activity, we need to keep abreast of the current developments on beyond design basis issues and new regulations, standards and criteria. We must continuously improve our knowledge in areas such as structural dynamics, seismic margin and probabilistic assessments, and seismic hazards. Our continued involvement will make our industry safer.

This newsletter provides a brief update on the SQUG activities and other issues of interest in nuclear power seismic design and qualification.

Divakar Bhargava
SQUG Chairman

In This Edition

Recent Earthquakes	1
Tohoku, Japan M9.0 Earthquake and Fukushima Dai-ichi and Daini Plants.....	2
Experience of North Anna Power Station Following the Mineral VA M5.8 Earthquake.....	2
Ongoing Earthquake Investigations	4
GSTERI, GIP - GERS and Evaluation of NAMCO Limit Switches and Solenoid Valves	4
Potential Future Research	5
Surveys and More Surveys.....	5
Seismic Training Programs.....	5
SQUG Walkdown Training	
SQUG Web-based Training	
Fukushima Task 2.3 Training	
Equipment Seismic Qualification	
Risk-informed / SPRA Training	
International Support/Meeting.....	6
NRC Near Term Task Force (NTTF) Recommendations on Fukushima and GI-199	6
CEUS Source Characterization	7
2011 Annual Winter Meeting	7
SQUG Steering Group and Membership Update.....	7
2012 SQUG Winter Meeting	7
In Closing	8

Recent Earthquakes



Twenty earthquakes of magnitude 7.0 or greater occurred in 2011 and were reviewed by the SQUG Steering Group. Most occurred in sparsely populated regions with little industry, and were consequently not of primary interest to SQUG. Three 2011 earthquakes were particularly important to SQUG: the M9 Tohoku earthquake off the coast of East Honshu, Japan; the M5.8 Virginia earthquake; and, to a

lesser degree, the M6.3 Christchurch earthquake in New Zealand.

The Christchurch earthquake is briefly described below and the Tohoku and Virginia earthquakes are covered in more detail in the two following articles.

Christchurch

On February 22, 2011, an M6.3 earthquake struck roughly 5 to 7 km south of the Central Business District (CBD) of Christchurch, New Zealand. Strong motion instruments in and around the CBD recorded PGAs up to 2.20g, but these strong motions were measured in only a very localized area.

Although it was far less energetic than the M7.1 Darfield earthquake of September 2010, it was much closer to the CBD and occurred during a busier time of day, so it was significantly more devastating.

The February 2011 earthquake caused partial or total collapse of many unreinforced masonry structures throughout the CBD, as well as a few notable catastrophic failures such as the collapse of the reinforced concrete Pyne Gould office building. Widespread soil failures such as liquefaction and lateral spreading caused or influenced many of the structural failures.



To date, SQUG has not targeted any industrial or power generation facilities for review since most of the industrial infrastructure is located outside of the regions affected by strong ground motions.

Tohoku M9.0 Earthquake and Fukushima Dai-ichi and Daini Plants

This most powerful earthquake ever to have hit Japan caused a tsunami that reportedly killed over 15,000 people with more than 7,000 still missing and presumed dead. Three aftershocks and a foreshock exceeded M7.0. The tsunami caused severe effects spanning 670 km of the eastern coastline, and inundated up to 7 km inland. In many places, tsunami devastation was so complete that investigation of ground shaking damage was impossible.



At the Fukushima-Daiichi nuclear plant complex, the damage from the tsunami was severe and has resulted in a worldwide effort to reassess the safety of nuclear plants subjected to beyond design basis events / severe accidents including earthquakes and flooding. The U.S. nuclear industry is preparing a program to meet the very ambitious requirements of this effort expected from the NRC.

At Fukushima Daini, the tsunami drove seawater into seven of the station's eight heat exchanger buildings and one of the reactor buildings. Although the earthquake tripped the station's four reactors, water damage in the heat exchanger buildings incapacitated the decay heat removal systems in three of the reactors. Operators brought the one reactor that retained core cooling capability into cold

shutdown within a day. They used several systems to maintain coolant inventory in the other three reactors, and within three days restored basic cooling capability and brought all three into cold shutdown. An EPRI technical review and walkdown in early May 2011 observed no earthquake effects on safety related structures, systems and components (SSCs), and only a few instances of seismic damage to non-safety related SSCs. Damage from the tsunami (saltwater exposure) in the heat exchanger buildings was significant, particularly on the electrical equipment.

EPRI, INPO, and NEI have formed a program ("The Way Forward") to learn and apply the more broad lessons from the event.

Experience of North Anna Power Station Following the Mineral, VA M5.8 Earthquake

With both North Anna units at 100% power and Unit 1 Turbine Driven AFW pump removed from service for scheduled surveillance test, a magnitude 5.8 earthquake with its epicenter 11 miles southwest of the nuclear station, near Mineral, VA occurred at 13:51 on August 23, 2011. Within a few seconds, the Reactor Trip Breakers opened due to a negative flux rate. The root cause of the automatic shutdown was determined to be a synergistic combination of seismically induced conditions, which included core barrel movement, detector movement, small reactivity effects from core movement and thickening of the thermal-boundary layer along the fuel rods. Within seconds, the Reserve Station Service Transformers (RSST) and Switchyard Transformer #2 tripped due to sudden pressure relay actuations causing loss of offsite power.

The plant had installed two types of instruments - active and passive devices - to record earthquake motions and provide annunciation to the control room (annunciation did not occur because of the loss of offsite power and no backup power source). The recorders are located in the Containment building and in the Auxiliary building. The most significant of these recordings were the time-history motions at the top of the reactor containment basemat in each of the three directions. Since this structure is rock-founded, these time-histories are a very good approximation of what the rock free-field motions were at the site. Dominion developed 5% damped response spectra from these time-histories and compared them at the same location against the plant's OBE, DBE (or SSE) and review level earthquake (anchored at 0.3g) that was used during the IPEEE evaluations in the 1990s. The figure below shows that the event exceeded the plant's OBE and DBE spectra. The Cumulative Absolute Velocity (CAV) calculated from the time histories was above the OBE exceedance threshold of

0.16 g-sec (defined by EPRI and endorsed by NRC RG 1.166 for plant restart after exceeding the OBE) in only one direction and it exceeded it by only by about 8%. In addition, a Husid plot that represents cumulative energy showed that the effective strong motion durations were between 1 to 3.1 seconds in each direction.

There was essentially no damage to the plant as determined from thorough walkdowns and inspections of all systems. Perhaps the worst visual damage was concrete spalling at the Powdex Demineralizer Tanks Base Pedestal (non-safety) in the Turbine building, though its anchorage was intact (see below).



The vertical spent fuel casks remained upright, all the radiological conditions were normal, and heat loads were in the acceptable range. However, some of the casks slid or shifted, the worst shift being 4.5" (see below).

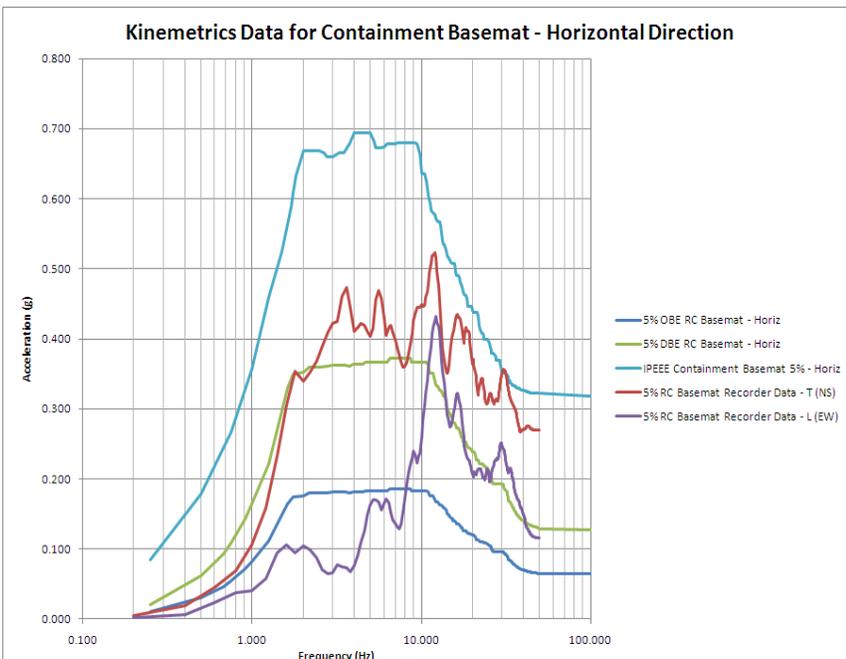


Dominion followed the restart criteria of EPRI NP-6695. The tests and inspections indicated that the earthquake was an EPRI damage intensity of zero; however, the station conservatively followed the inspection and restart guidance for an intensity of one.

The NRC sent several teams to the station over a period of two months and Dominion responded to over 120 NRC requests for additional information. The NRC gave its approval for restart on November 11, 2011 and both units were in operation within about 10 days.

For the long term, Dominion committed to installing free-field instruments, performing sample evaluations as required by EPRI NP-6695, and implementing a seismic margin management program to evaluate plant modifications and design changes using in-structure response spectra developed from the recorded motions of the August 23 event.

The lessons learned from the North Anna experience are bound to have an impact on our industry. EPRI plans to update the post earthquake guidance report NP-6695 and the NRC is considering revisions to RG 1.166 and 1.167. Just this month, INPO issued



Event Report 12-12 that requires plants to develop corrective actions and implement plans to assess their seismic monitoring equipment and review their procedures in response to a seismic event.

Ongoing Earthquake Investigations

SQUG is continuing to investigate the July 2007 NCO earthquake near the Kashiwazaki-Kariwa (KK) nuclear plant in Japan and the 2010 Baja California earthquake.

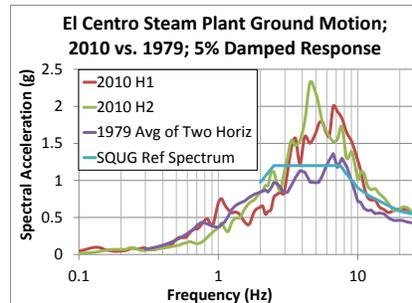
Much of the effort involved in the KK investigation involves translating, organizing, and coordinating the wide range of information obtained from various sources.



The data collected by SQUG includes detailed TEPCO documentation from their visual inspections and in-depth equipment performance testing, SQUG investigations, and EPRI post-earthquake reviews following the procedures in EPRI 6695.

The 2010 Baja earthquake caused PGAs at the El Centro Steam plant that exceeded those from 1979 Imperial Valley earthquake, which represents one of the four original earthquakes which were the basis for the SQUG Reference Spectrum. SQUG is currently attempting to coordinate a visit to the El Centro Steam Plant to compare the 2010 earthquake

effects with those from the 1979 Imperial Valley earthquake and be able to add this information into the SQUG database.



G-STERI, GIP - GERS and Evaluation of NAMCO Limit Switches and Solenoid Valve

In the August 2010 edition of the SQUG newsletter, we reported on the preliminary results of SQUG's review of the updated G-STERI Evaluations (EPRI reports 1016691 and 1016694). The intent of this review was to see if the changes made to the G-STERI evaluations had any impact on the GIP equipment classes or the GERS.

Our review of the G-STERI changes has concluded that there are no adverse impacts on the GIP class definitions or capacities.

However, the apparent low seismic capacity of a NAMCO limit switch required a detailed review of the shake table test report to conclude that the reported results were an anomaly and did not adversely affect the GIP equipment classes or the GERS.



Mechanically actuated NAMCO limit switches are commonly used on air-operated valves. During the

relay evaluation for the USI A-46 program, these switches were routinely screened out and not considered further because they were considered seismically rugged.

However, the SQRSTS shake table tests, on which the revised G-STERI evaluations were based, reported that this limit switch chattered for a duration of exactly 2ms during a SSE test in which the RRS was 14g peak spectral acceleration and 6.3g zero period acceleration. If this test result was valid, then the NAMCO limit switch might not be considered "seismically rugged" and the validity of the GIP relay screening evaluations could be called into question.

During SQUG's review of this SQRSTS test, it was concluded that the NAMCO limit switch was significantly over tested, particularly in the high frequency range. SQUG concluded that the contacts in the NAMCO limit switch would not have chattered if the vertical motion of the shake table (the direction in which the contacts in the limit switch were oriented) had been controlled so that the TRS more closely matched the RRS in the high frequency range. If this had been done, then the contacts would very likely not have failed the chatter duration limit of less than 2ms (Note: The chatter duration in the test was exactly 2ms, which is the smallest unacceptable duration permitted by IEEE Std C37.98). As documented in the SQRSTS report, the TRS was more than twice as high as the RRS in the high frequency range where the contacts are likely to respond to dynamic loading.

SQUG concluded that if this refinement had been made to the shake table test, the NAMCO limit switch would not have chattered.

Therefore, it was concluded that the NAMCO limit switches are inherently rugged and the SQUG evaluations based on this screening criterion remain valid.

For an ASCO solenoid valve that leaked during a test with the test spectra apparently slightly below the SQUG-GERS, a time-history analysis was performed together with the piping. The initial conclusion is that the GIP-GERS was not exceeded and remains valid.

Potential Future Research

We know that EPRI is the research arm of the US nuclear industry and SQUG is receptive to new ideas to furthering research in the equipment seismic qualification area. At the recent Steering Group and annual SQUG member meetings, a few new research ideas were presented. Among them: use of earthquake experience data to develop seismic fragilities of 20 classes of equipment and methods of tuning structural models to develop responses from dynamic analyses that closely match recorded motions from an earthquake within a structure. The SQUG Steering Group will consider if resources should be allocated to conduct new research in the coming years. If you have a new idea on a research topic that SQUG should pursue, please contact a Steering Group member.

Surveys and More Surveys

Towards the end of 2010, we conducted a detailed survey of SQUG members on several topics of interest. Among them: use of the GIP method and its cost benefit, methods of performing seismic qualification of equipment, training and general feedback.

In early 2011, we conducted another survey on two issues. One was on the topics for web-based training sessions. The responses were compiled to determine the priority of each topic. This ranking will be used to conduct appropriate web-based training sessions in the future. The second survey was to solicit feedback on whether SQUG should expand its scope to include other seismic qualification methods and seismic issues without changing the membership dues. Members were favorable to this and we compiled a ranking of several suggested ideas in order of their priority for expanding the SQUG scope. The Steering Group has deferred the expansion of scope for now but we can revive this in the future if there is sufficient member interest.

The details, results and graphs of these surveys can be accessed from the recent SQUG meeting minutes that have been posted on the SQUG web site.

Seismic Training Programs

In the seismic area, this year seems to be the year of training. A combination of several industry initiatives and pending retirements of experienced engineers appears to have caused a tremendous desire for young engineers in our industry to be trained in various seismic-related topics. Below are descriptions and status of SQUG-sponsored training as well as some other seismic-related training programs.

SQUG Walkdown Training:

Based on the feedback from attendees during previous walkdown training courses, SQUG updated some of the training modules last year. That effort will continue this year to improve the

presentation material and the video files.

In early January, we asked if you would be interested in taking the one-week walkdown course. The interest and response from domestic members, international members and SQUG consultants was overwhelming. Based on the responses, there will likely be two sessions given this year. While the training will be cost-free to the direct SQUG members, SQUG consultants and contractors who want to attend must be sponsored by a member and will need to bear the cost. If you are interested in attending this course and have not yet informed us, please let us know soon. We will communicate the details of the planned sessions of the walkdown training course around March-April.

SQUG Web-based training:

In the survey that was conducted at the end of 2010, members expressed substantial interest in the Web-based training modules. Several topics were suggested. The SQUG Steering Group decided that we should conduct web-based sessions periodically. We plan to conduct live web-based training sessions in the first half of this year potentially on experience based HVAC and Piping evaluations and on housekeeping.

In addition, several short training videos have already been posted to the SQUG web site. These videos provide you with (1) an overview of the contents of the SQUG web site, (2) how to use the search engine on the SQUG web site, and (3) an overview of the more than 600 questions and answers posted to the SQUG web site on how to apply the SQUG method for seismic evaluation of equipment. Check out the videos at: <http://squgweb.mpr.com/22.0-Videos.htm>.

Training for Fukushima Task 2.3

EPRI is in the process of developing a procedure for the industry to respond to the anticipated 50.54(f) NRC letter that will come out in early March on Fukushima NTTF recommendation 2.3. Following industry and NRC acceptance of the walkdown procedure, EPRI plans to give several sessions of a 2-day training course, likely from May through August of this year to facilitate implementation of the walkdowns. A module for the walkdowns training required for this task is being prepared. EPRI will communicate more details when the training becomes available. While this will not replace the SQUG one-week training, anyone who takes (or has taken) the SQUG course will not need to take this new 2-day training course.

Equipment Seismic Qualification

EPRI Plant Support Engineering (PSE) is offering a 3-day course on Fundamentals of Equipment Seismic Qualification from Tuesday, May 8, 2012 through Thursday, May 10, 2012 at EPRI's Charlotte, NC offices. If interested, please contact Mr. Charlie Mengers at 484-431-8767 or at cmengers@epri.com

Risk-informed / SPRA Training

EPRI plans to give two identical one-week courses on seismic PRA methods in 2012. The first one will be on April 23-27 in Newport Beach, CA (1 day on hazard, ½ day on systems, ½ day on quantification and 2.5 days on fragility and margin). The class will be limited to about 20 persons. The same course will be given again in the fall of this year. There is a substantial industry interest in this course because of Fukushima NTTF recommendation 2.1. If you have an interest in attending this

course, please contact Dr. R. P. Kassawara at (650) 855-2302 or at rkassawa@epri.com

International Support and Meetings

Last year, EdF decided to give the SQUG Walkdown Training Course in the French language. An EdF team led by their SQUG representative, Sebastien Ravet, translated the course workbook into French and Jean Francois Roy of EPRI performed a page-by-page edit. The first "hybrid" course (French and English) was given in Marseilles, France during April 11-15, 2011. Sebastien and his EdF colleagues in France gave the first completely independent French language course on June 6-12, 2011. Congratulations Sebastien!

Similar to the past practice, SQUG is considering organizing meetings in Europe later this year to support our international members. If such meetings are held, the discussions will be based on the needs of the international members and would include topics such as application of the GIP and database, ongoing and proposed U.S. and European research programs, Fukushima and North Anna related initiatives in the US, training, and improved communication. The Steering Group may consider the ideas discussed at the meeting for future research, as applicable. If you are interested in hosting such a meeting, please contact Dr. Kassawara or me (our contact information is at the end of this newsletter).

NRC Near Term Task Force (NTTF) Recommendations on Fukushima and GI-199

In July 2011, NRC's Near Term Task Force on Fukushima came out with several recommendations.

Some of these recommendations ask the NRC to order U.S. nuclear plant licensees to perform certain tasks. Recommendation 2 is for seismic assessments and it has three parts. The NRC has stated that part 2.2 can be addressed in the long term but implementation of parts 2.1 and 2.3 needs to start immediately. They are as follows:

- 2.1 Order licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis and SSCs important to safety to protect against the updated hazards.
- 2.3 Order licensees to perform seismic and flood protection walkdowns to identify and address plant-specific vulnerabilities and verify the adequacy of monitoring and maintenance for protection features such as watertight barriers and seals in the interim period until longer term actions are completed to update the design basis for external events.

In September 2011, the NRC issued a draft Generic Letter on GI-199, "Implications of updated seismic hazards on operating nuclear plants". The draft letter contained ambitious schedules and expectations from the industry to develop updated seismic hazard curves and identify risk-significant SSCs based on the new hazards.

In January 2012, the NRC issued two 50.54(f) draft letters, one on Fukushima NTTF recommendation 2.1 and the other on 2.3. On February 17, the NRC issued SECY-12-0025, which contains the updated versions of the 50.54(f) letters as enclosures. The final letters are expected to be issued in

early March. On recommendation 2.1, the enclosure requires plants to develop site-specific hazard curves in 18 months and after the NRC completes the screening, plant that have GMRS > SSE will be required to perform seismic PRAs or margin analyses in the subsequent three years. The draft letter on 2.3 requires each licensee to develop NRC-endorsed seismic walkdown procedure or process in the next four months and complete the walkdowns in the subsequent six months with the exception of inaccessible areas.

Note that the NRC has stated that the 50.54(f) letter on NTTF recommendation 2.1 will subsume the GI-199 issue, thus there will be no Generic Letter on GI-199 and this issue will be closed.

During the past months, there have been several industry and NRC meetings and interactions. Some U.S. industry experts believe that there are not sufficient domestic resources for operating plants to accomplish the efforts required by the NRC draft 50.54(f) letters, particularly on recommendation 2.1, to meet the schedules outlined by the NRC. An NRC public meeting will be held on March 1 / 2 on both these recommendations and we will no doubt see more industry and NRC interactions in the coming months to streamline the process for these two tasks.

CEUS Source Characterization

The Central and Eastern U.S. (CEUS) seismic source characterization model for nuclear facilities was completed and released on January 31, 2012. The model used the SSHAC Level 3 assessment process and EPRI, NRC, and DOE supported its development. It replaces the old EPRI/LLNL source characterization

models. This model, together with the current EPRI-04/06 ground-motion prediction (or attenuation) equations (GMPEs) and site soil characteristics, is planned to be used by EPRI for operating plants in the CEUS to perform probabilistic seismic hazard analyses (PSHA). These PSHAs would meet the requirements of RG 1.208, which is used for new plants. The outputs of a PSHA are site-specific seismic hazard curves, uniform hazard response spectra (UHS) for several annual frequencies of exceedance and Ground Motion Response Spectrum (GMRS), which is an interpolation between 1E-4 UHS and 1E-5 UHS and is defined as the SSE for new plants. These curves, once developed for CEUS plants, can be used to perform margin assessments or seismic PRAs for the resolution of Fukushima NTTF recommendation 2.1. Note that in another ongoing industry research program - NGA-East, sponsored by the NRC and others, the GMPEs are planned to be updated by 2015. For further information on the CEUS model, please visit: <http://www.ceus-ssc.com>

2011 Annual Winter Meeting

The 2011 SQUG winter meeting was held on December 9-11, 2011 in Sanibel, Florida. Engineers from seven domestic and three international utilities attended the meeting.

A round table discussion provided the attendees a forum to discuss their plant-specific seismic issues and the discussion was, as always, a good exchange of information and a learning experience.

There were valuable presentations on recent earthquakes and Fukushima initiatives. Mr. Hideki Masui of TEPCO provided an

2012 SQUG Winter Meeting

Even though it is early to plan, please make a note on your calendar that this year's winter meeting will be held in the Phoenix, Arizona area on December 5-7, 2012. The meeting will follow the usual ½ day - full day - ½ day format. The hotel venue is yet to be decided. Look for more information in the coming months!

insightful summary of the March 11, 2011 M9 Tohoku earthquake and its effect on the Fukushima units. Of particular significance was his observation that the earthquake itself did not cause any safety-related damage. Mr. Divakar Bhargava and Mr. Joe Vasquez of Dominion provided the details of the North Anna plant's response and restart efforts due to the August 23, 2011 M5.8 Mineral, Virginia earthquake. Mr. Sebastian Ravet of EdF provided a summary of the recent EDF stress tests performed as part of the Fukushima initiative. Mr. Greg Hardy of SGH provided an update of the significant earthquakes in 2011 and a summary of the earthquake investigations process. SQUG support for the resolution of Fukushima initiatives, including the need to provide SQUG walkdown training courses, was discussed.

The minutes of the meeting contain the presentations and details of the various topics; they were recently posted on the SQUG web site.

SQUG Steering Group (SG) and Membership Update

As you may recall from the August 2010 Newsletter, Mr. John Richards relinquished the SQUG Chairmanship in mid-2010. We sincerely appreciate John's many years of dedication, energy,

February 2012

innovation and countless hours of “above and beyond” effort as the SQUG Chairman. We know that John will continue to provide valuable guidance to SQUG when called upon to do so.

There have been several changes in the SQUG Steering Group (SG). Mr. Ashwin Patel of OPPD has retired from the SQUG SG. Thanks for your contributions, Ashwin! Mr. Dhiren Pandya of Progress Energy has agreed to serve as SQUG’s Vice-Chair. Mr. Al Lyon of Entergy and Mr. Russell Childs of Duke have joined the SG. Mr. Sebastien Ravet of EdF has also joined the SG as the first-ever international member. We welcome Dhiren, Al, Rusty and Sebastien and know that with their experience and knowledge, they will bring fresh ideas to SQUG. Note that besides having EdF’s and Sebastien’s continuing and enthusiastic participation in and support of the SQUG program, the SG has asked Sebastien to serve as a point of contact for the European members. The hope is that this will lead to closer contact with the European members to enable SQUG to better serve their needs.

We have some excellent news to share on the membership front. Although Tokyo Electric Power Co. discontinued its membership in SQUG in 2011, NextEra Energy (Point Beach plant) has rejoined SQUG and the Taiwan utility - Taipower has also joined SQUG. And, just this month, Arizona Public Service joined to become our 16th domestic member and Atomic Energy Limited of Canada (AECL) and UNESA (Spain) have joined as our 15th and 16th international members. We are pleased to welcome our newest SQUG members. We now have 32 SQUG members and there is a possibility that we will gain an

additional international member in 2012!

The current Steering Group members (in addition to Bob and Divakar) are listed below. If you have a membership or technical inquiry, or would like to share your ideas or comments, please feel free to contact any SG member.

Mr. Dhiren Pandya
SQUG Vice-Chairman
Progress Energy Company
Phone: (919) 546-7431
Fax: (919) 546-4361
dhiren.pandya@pgnmail.com

Mr. Donald P. Moore
Southern Nuclear Company
Phone: (205) 992-6672
dpmoore@southernco.com

Mr. Daniel J. Fiorello
Exelon Nuclear
Phone: (610) 765-5946
daniel.fiorello@exeloncorp.com

Mr. Russell P. Childs
Duke Energy
Phone: (864) 885-4402
rpchilds@duke-energy.com

Mr. Alan Lyon
Entergy
Phone: (269) 764-2921
alyon@entergy.com

Mr. Sebastien Ravet
EDF – France
Phone: +33 4 72 82 74 73
sebastien.ravet@edf.fr

In Closing

We hope that this newsletter will help keep you up to date on our SQUG activities and other current significant seismic issues of interest in the nuclear power industry. If you have comments in any area or contributions for the next newsletter, please let us know.

Finally, we wish you a very productive 2012.



Divakar Bhargava
SQUG Chairman
Dominion Generation
Phone: (804) 273-3638
Fax: (804) 273-3448
divakar.bhargava@dom.com



R. P. Kassawara, SQUG
Program Manager, EPRI
Phone: (650) 855-2302
Fax: (650) 855-1026
rkassawa@epri.com

Abbreviations used in this edition (may not be defined in the text):
DOE – Department of Energy
GERS – Generic Equipment Ruggedness Spectra
EdF – Electricite de France
EPRI – Electric Power Research Institute
GERS – Generic Equipment Ruggedness Spectrum
GIP – Generic Implementation Procedure
GSTERI – Generic Seismic Technical Evaluation of Replacement Items
IPEEE – Individual Plant Examination of External Events
LLNL- Lawrence Livermore National Laboratory
NGA- Next Generation Attenuation
NRC – Nuclear Regulatory Commission
OBE – Operating Basis Earthquake
PGA – Peak Ground Acceleration
SG – Steering Group
SSE – Safe Shutdown Earthquake
SSHAC – Senior Seismic Hazard Analysis Committee
SPRA – Seismic Probabilistic Risk Assessment
SQUG – Seismic Qualification Utility Group
TEPCO-Tokyo Electric and Power Company