Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

June 10, 2010
U7-C-STP-NRC-100128

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Request for Additional Information

Attached is the STP Nuclear Operating Company (STPNOC) supplemental response to Request for Additional Information (RAI) question 02.05.02-28, which was originally submitted in STPNOC Letter U7-C-STP-NRC-100057 (ML100770389) dated March 15, 2010. This supplemental response provides a sensitivity study of the results of the probabilistic seismic hazard analysis for the STP site using alternate weightings of the seismic maximum magnitude (Mmax) values for the Gulf Coast Source Zones. The results of this sensitivity study were discussed with the NRC during a public teleconference on May 12, 2010. Also attached is the revised schedule for responding to RAI letter number 333. This revised schedule replaces the schedule provided in STPNOC Letter U7-C-STP-NRC-100107, dated May 17, 2010, and documents the scheduled agreed upon with the NRC during a teleconference on June 2, 2010. Attachment 1 provides the response to the RAI questions listed below:

02.05.02-28, Supplement 1

No COLA changes are required as a result of this supplement.

There are no commitments in this letter.

If you have any questions, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

D091
NRO

STI 32687035

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 6/10/10

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

rhb

Attachments: 1. RAI 02.05.02-28, Supplement 1
2. Response Date Extension for RAI Questions

cc: w/o attachments and enclosure except*
(paper copy)

Director, Office of New Reactors
U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Regional Administrator, Region IV
U. S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

Kathy C. Perkins, RN, MBA
Assistant Commissioner
Division for Regulatory Services
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

Alice Hamilton Rogers, P.E.
Inspection Unit Manager
Texas Department of State Health Services
P. O. Box 149347
Austin, Texas 78714-9347

C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

*Steven P. Frantz, Esquire
A. H. Gutterman, Esquire
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Ave. NW
Washington D.C. 20004

*Tekia Govan
Two White Flint North
11545 Rockville Pike
Rockville, MD 20852

(electronic copy)

*George F. Wunder
*Tekia Govan
Loren R. Plisco
U. S. Nuclear Regulatory Commission

Steve Winn
Joseph Kiwak
Eli Smith
Nuclear Innovation North America

Jon C. Wood, Esquire
Cox Smith Matthews

Richard Peña
Kevin Pollo
L. D. Blaylock
CPS Energy

RAI 02.05.02-28, Supplement 1

**QUESTION:**

During a public teleconference with the NRC Staff on April 6, 2010, STPNOC agreed to perform a sensitivity study that applies the initial, preliminary Mmax distribution suggested for updating the EPRI-SOG Gulf Coastal Source Zones (GCSZs). Preliminary results of the sensitivity study were discussed with the NRC during a May 12, 2010 public teleconference and STPNOC agreed to submit the results of the study to the NRC. The requested information is being provided as a supplemental response to RAI 02.05.02-28 (STPNOC Letter U7-C-STP-NRC-100057 (ML100770389) dated March 15, 2010).

**RESPONSE:**

Background

In a series of RAI questions (RAIs 02.05.02-13, 02.05.02-21, and 02.05.02-28) and public teleconferences (April 6, 2010 and May 12, 2010), the NRC asked STPNOC for clarification and additional information on how the EPRI-SOG (EPRI, 1986-1989) maximum magnitude (Mmax) values for the Gulf Coast Source Zones (GCSZs) were updated for use in the development of a probabilistic seismic hazard analysis (PSHA) for the STP site. In FSAR Subsection 2.5S.2.4 and in response to these RAI questions, STPNOC has demonstrated that:

- The Mmax updates were developed following the guidance of NRC Regulatory Guide (RG) 1.208.
- A Senior Seismic Hazard Analysis Committee (SSHAC) Level 2 study was conducted to update the Mmax values so that the resultant Mmax values would represent the "legitimate range of technically supportable interpretations among the entire informed technical community" (NUREG/CR-6372, Volume 1, page 6).
- The SSHAC process resulted in updates to five of the six GCSZs. The Law and Dames & Moore GCSZ Mmax distributions were updated based on the February 10, 2006 Emb 5.5 earthquake in the Gulf of Mexico, which occurred within or very close to these two zones. The larger Gulf of Mexico earthquake of September 2006 occurred well to the south of the Law and Dames & Moore GCSZs but within the Bechtel, Weston, and Rondout GCSZs. Accordingly, the Mmax distributions for the Bechtel, Weston, and Rondout zones were updated based on the occurrence of the September 10, 2006 Emb 6.1 earthquake.
- The combined set of these six updated GCSZ characterizations provides an appropriate and reasonable basis for seismic hazard contribution at the STP 3 & 4 site from the Gulf coastal region.

In the response to RAI 02.05.02-21, STPNOC described, in detail, the SSHAC process that was followed to develop the updated Mmax distributions. For this update, a highly qualified peer review panel (PRP) was assembled. As discussed in the RAI response, the technical integrators

(TIs) suggested a preliminary Mmax update for the GCSZs, which was presented to the PRP as a starting point for this update. The preliminary update suggested the use of a uniform Mmax distribution for each GCSZ (Bechtel BZ1, Dames & Moore 20, Law 126, Rondout 51, Woodward Clyde B43, Weston 107) with Emb magnitudes 6.1 (.1), 6.6 (0.4), 6.9 (0.4), and 7.2 (0.1). As reiterated in the responses to RAIs 02.05.02-21 and 02.05.02-28, this initial Mmax distribution was: 1) preliminary; 2) developed before completion of the SSHAC process; 3) not developed following the guidance of RG 1.208; and 4) replaced with revised Mmax distributions for each GCSZ shown in FSAR Table 2.5S.2-13 in response to PRP review comments. The initial, preliminary distribution was not intended to represent the "legitimate range of technically supportable interpretations among the entire informed technical community" (NUREG/CR-6372, Volume 1, page 6); and, thus use of this preliminary, uniform Mmax distribution for hazard calculations for the STP 3 & 4 site would be inconsistent with the guidance provided in RG 1.208.

However, during a public telephone conference with the NRC Staff on April 6, 2010, the NRC requested that STPNOC perform a sensitivity analysis to investigate the impact that the use of this preliminary Mmax distribution would have on the ground motion response spectrum (GMRS) for the STP 3 & 4 site. Specifically, the NRC requested the following three different cases be analyzed (see Table 1):

Case 1: Applying the preliminary, uniform Mmax distribution to zones Bechtel BZ1, Rondout 51, and Weston 107;

Case 2: Applying the preliminary, uniform Mmax distribution to the three zones in Case 1 and to zones Dames & Moore 20 and Law 126; and,

Case 3: Applying the preliminary, uniform Mmax distribution to the five zones in Case 2 and to zone Woodward Clyde B43.

The remainder of this supplemental RAI response describes the results of the sensitivity analysis.

Cases Used in the Sensitivity Analysis

As outlined above, the NRC requested that STPNOC analyze the sensitivity of the site-specific GMRS to the three hypothetical Mmax distribution cases listed in Table 1.

**Table 1** Mmax Distributions for Gulf Coast Source Zones (GCSZs).

| Gulf Coast Source Zone | EPRI-SOG Original Mmax | STP Updated Mmax FSAR Table 2.5S.2-13 | Case 1 Mmax | Case 2 Mmax | Case 3 Mmax |
|---|---|---|---|---|---|
| Bechtel Group - BZ1 | 5.4 [0.1]<br>5.7 [0.4]<br>6.0 [0.4]<br>6.6 [0.1] | 6.1 [0.10]<br>6.4 [0.40]<br>6.6 [0.50] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] |
| Dames & Moore - 20 | 5.3 [0.8]<br>7.2 [0.2] | 5.5 [0.80]<br>7.2 [0.20] | 5.5 [0.80]<br>7.2 [0.20] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] |
| Law - 126 | 4.6 [0.9]<br>4.9 [0.1] | 5.5 [0.90]<br>5.7 [0.10] | 5.5 [0.90]<br>5.7 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] |
| Rondout - 51 | 4.8 [0.2]<br>5.5 [0.6]<br>5.8 [0.2] | 6.1 [0.30]<br>6.3 [0.55]<br>6.5 [0.15] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] |
| Weston - 107 | 5.4 [0.71]<br>6.0 [0.29] | 6.6 [0.89]<br>7.2 [0.11] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] |
| Woodward Clyde - B43 | 4.9 [0.17]<br>5.4 [0.28]<br>5.8 [0.27]<br>6.5 [0.28] | 4.9 [0.17]<br>5.4 [0.28]<br>5.8 [0.27]<br>6.5 [0.28] | 4.9 [0.17]<br>5.4 [0.28]<br>5.8 [0.27]<br>6.5 [0.28] | 4.9 [0.17]<br>5.4 [0.28]<br>5.8 [0.27]<br>6.5 [0.28] | 6.1 [0.10]<br>6.6 [0.40]<br>6.9 [0.40]<br>7.2 [0.10] |

As discussed above, the Mmax distribution that forms the basis for this sensitivity analysis is a preliminary, uniform distribution developed early in the SSHAC process. As described in the response to RAI 02.05.02-28, use of this hypothetical distribution is not consistent with the regulatory guidelines presented in RG 1.208 because the distribution is not the final result of a completed SSHAC process. Based on the observation that the preliminary Mmax distribution generally has higher magnitudes than the Mmax distributions that were developed in the SSHAC process, the preliminary distribution is more conservative than the distributions used in the COLA. Because the Mmax distributions in the COLA were designed to represent the "legitimate range of technically supportable interpretations among the entire informed technical community" (NUREG/CR-6372, Volume 1, page 6), the resultant GMRS values based on this preliminary, uniform Mmax distribution are more conservative than values that are developed based on RG 1.208 guidance.

The Case 1 sensitivity analysis revises the EPRI-SOG Mmax distributions used in the COLA for the Bechtel BZ1, Rondout 51, and Weston 107 zones to the preliminary Mmax distribution, as shown in Table 1. The basis for only updating these three zones is that the Woodward Clyde, Dames & Moore, and Law GCSZs were not intended to represent the central Gulf of Mexico region where the September 2006 earthquake occurred (see attached FSAR Figure 2.5S.2-8). Areal source zones, such as the GCSZs, are intended to encompass regions of the crust that have common future earthquake characteristics (e.g., Mmax). As such, the seismic source

characteristics that parameterize these zones are defined by seismological, geological, and geophysical observations from the area within the zones, not from neighboring regions outside the zones that are interpreted as having different future earthquake characteristics. The EPRI-SOG earth science teams (ESTs) defined source zone geometries based on their interpretations of the geologic and seismotectonic setting of the crust, thus delineating regions of the crust that they interpreted as having common future earthquake characteristics. The Woodward Clyde, Dames & Moore, and Law ESTs were deliberate in drawing the southern margins of their GCSZ boundaries. The fact that these zones do not include the region of the September earthquake indicates that these three ESTs did not believe that the region where the September earthquake occurred has the same future earthquake characteristics as the regions within their respective GCSZs. Therefore, it is not appropriate to use the September earthquake as a basis for updating the Mmax values of these zones.

In the EPRI-SOG documentation, Law indicates that the southern boundary of their zone was explicitly drawn to follow the continental shelf, and Dames & Moore indicates that their zone was drawn to encompass the "down warping miogeosynclinal wedge of sediments accumulating since the Cretaceous" (EPRI, 1986-1989, vol. 7 and vol. 6, p. B-19). As is apparent from the basis for the zone boundaries, these zones explicitly do not extend into the more central region of the Gulf of Mexico, near where the September 2006 earthquake occurred, reflecting these ESTs' interpretation that the central Gulf of Mexico has different future earthquake characteristics than their GCSZs are intended to represent.

The division in future earthquake characteristics indicated by the southern boundary of the Dames & Moore and Law zones is reasonable and logical because the southern boundary of these zones roughly delineates the boundary between the thinned continental crust of the GCSZs and the oceanic crust within the central Gulf of Mexico, which is geologically, seismologically, and geophysically distinct from the thinned continental crust (see FSAR Figures 2.5S.1-15 and 2.5S.1-21). Therefore, given the large distance between the southern boundary of these zones and the September 2006 earthquake (see FSAR Figure 2.5S.2-8 and Table 2.5S.2-15), combined with the technical basis for defining the zone boundary, it is not appropriate or technically supportable to use the September earthquake as a basis for updating the maximum magnitude distributions for these two GCSZs. In contrast, the February 2006 earthquake occurs just outside the boundary of these two zones within crust that is similar to that characterized by these GCSZs (e.g., transitional crust), so the Mmax distributions for these zones in the COLA (and the Case 1 sensitivity analysis) are based on the Emb 5.5 February 2006 earthquake (see FSAR Subsection 2.5S.2.4.3).

Woodward Clyde defined their GCSZ as an approximately 200-mile square background source zone proximal to the STP 1 & 2 site. This zone represents the interpretation of the Woodward Clyde EST that: (1) only the seismicity within this extent defines the potential for future "background" earthquakes for the STP 3 & 4 site (i.e., seismicity at great distances from the site does not impact the background seismicity near the site); and (2) the extent and geometry of this zone does not depend on regional geologic or seismotectonic features. The large distance between this zone and both the September and February 2006 earthquakes (see FSAR Figure 2.5S.2-8 and Table 2.5S.2-15), combined with the basis for the zone geometry, indicates that it is not appropriate or technically supportable to use either of these earthquakes as a basis for

updating the maximum magnitude distribution for this GCSZ. Therefore, the Mmax distribution for this zone was not updated from that used in the STP 3 & 4 COLA for the Case 1 sensitivity analysis.

The Case 2 sensitivity analysis updates the Mmax distribution for the Bechtel, Dames & Moore, Law, Rondout, and Weston GCSZs, and the Case 3 sensitivity analysis updates the Mmax distribution for all six of the GCSZs (see Table 1). As mentioned above, it is not considered technically appropriate to update the Dames & Moore, Law, and Woodward Clyde zones based on the September event since these zones were not meant to describe the oceanic crust within which the September 2006 earthquake likely occurred (e.g., Bird et al., 2005; Hall and Najmuddin, 1994; Marton and Buffler, 1994; Pindell et al., 2000; Sawyer et al., 1991). In addition, applying a uniform Mmax distribution to all or most of the GCSZs significantly reduces the epistemic uncertainty in the GCSZ characterizations by removing the independent interpretations of these ESTs. This reduction degrades the SSHAC Level 4-equivalent characteristics of the EPRI-SOG model. However, as discussed during the April 6, 2010 conference call, STPNOC agreed to conduct the sensitivity analysis to assess the impacts of these additional cases on the PSHA and related GMRS at the STP 3 & 4 site.

PSHA Methodology

As described in FSAR Subsection 2.5S.2.4, the final PSHA for hard rock conditions at the STP site was calculated with the EPRI-SOG (EPRI, 1986-1989) team sources, modified to consider additional seismicity in the Gulf of Mexico, and to include the addition of a New Madrid Seismic Zone model to each team's interpretation. Besides the New Madrid Seismic Zone, the following EPRI EST sources were included:

| | |
|---|---|
| Bechtel Group: | sources BEC-BZ1, BEC-BZ2 |
| Dames & Moore: | sources DAM-20, DAM-25, DAM-C08 |
| Law: | sources LAW-124, LAW-126 |
| Rondout: | source RND-51 |
| Woodward-Clyde: | source WCC-B43 |
| Weston: | source WGC-107 |

Table 1 above shows the original EPRI-SOG maximum magnitude (Mmax) distributions for each of the EST Gulf Coastal Source Zones (GCSZs), the Mmax updates for these sources, and the Mmax distributions used for each of the three cases considered in the sensitivity analyses.

The Mmax distributions for the remaining EPRI EST sources (that is, for BEC-BZ2, DAM-25, DAM-C08, and LAW-124) were unchanged for this sensitivity analysis from the values identified in the STP COLA.

Hard rock PSHA results were derived for each of the three sensitivity analysis cases by combining contributions to the STP site hazard from all sources considered in the STP COLA retaining, again, the existing COLA parameterization for non-GCSZs (i.e., Bechtel Group source BEC-BZ2; Dames & Moore sources DAM-25 and DAM-C08; and Law source LAW-124), and using the preliminary Mmax distributions of Cases 1 through 3 for the GCSZ sources.

As agreed with the NRC during the April 6 teleconference, this sensitivity study assumed that the site amplification factors to bring the hard rock motions up to the GMRS horizon are, for all cases, the same factors as those considered in developing the existing GMRS in the STP COLA. That is, any nonlinear effects of the site soil column can be ignored because the rock input motions are small and similar to the rock motions used in the GMRS in the STP COLA.

Results

Comparisons between the hard rock PSHA results for the STP COLA and the three hypothetical Mmax distribution sensitivity cases, and for several response spectrum frequencies, are shown in Figure 1.

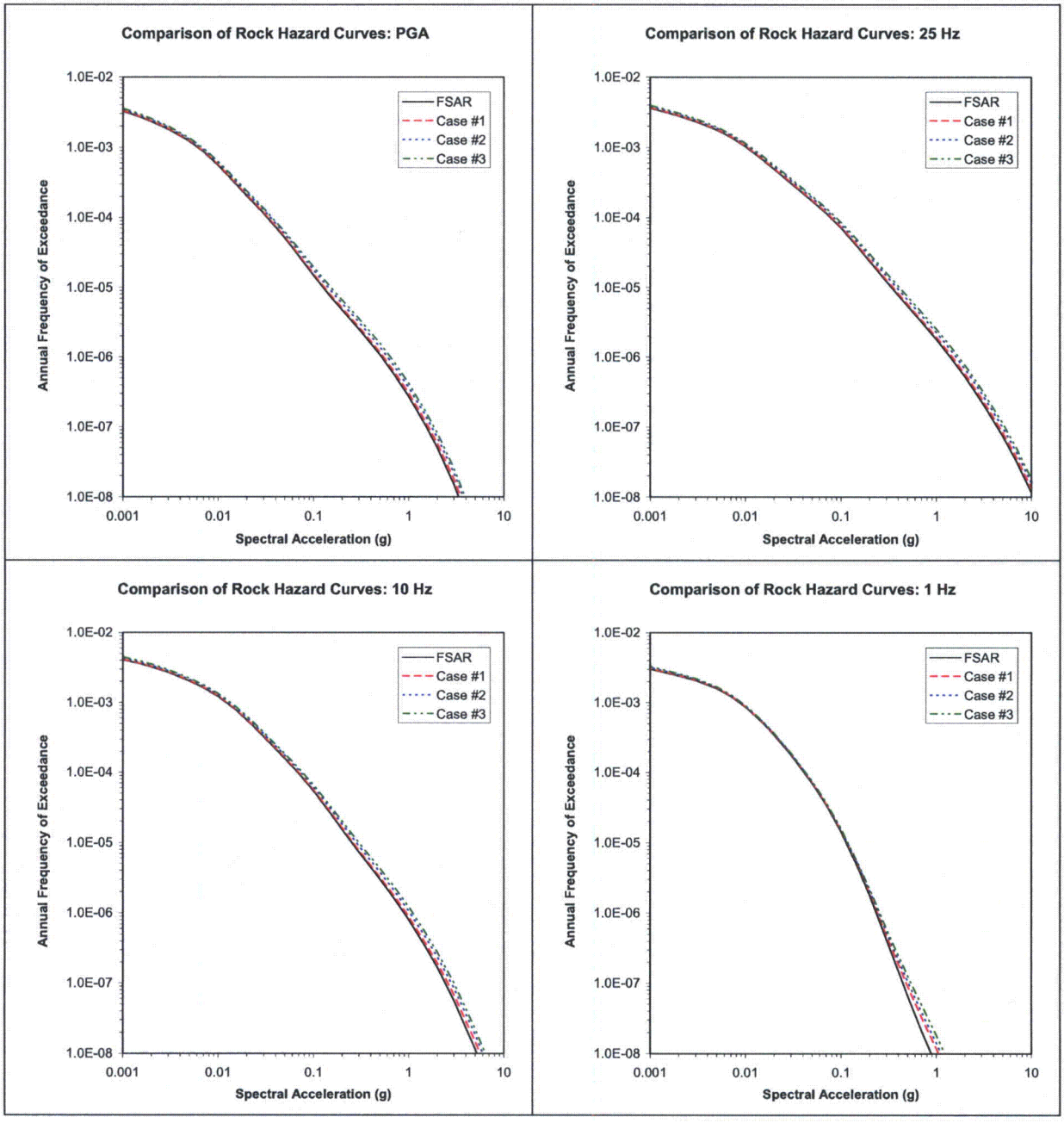


**Figure 1**.Comparison of rock seismic hazard curves for several response spectrum frequencies (peak ground acceleration (PGA) and 25, 10, and 1 Hz) from the STP FSAR and the three hypothetical Gulf Coast Mmax distribution cases.

GMRS response spectral values derived, using the methodology recommended in RG 1.208, from the $10^{-4}$ and $10^{-5}$ hard rock PSHA values, multiplied by the frequency-dependent site-specific amplification factors used to develop the original STP 3 & 4 FSAR GMRS, are listed in Table 2 and shown in Figure 2.

**Table 2.** Mmax Sensitivity Analyses: "Soil GMRS" (in g) Base vs. Hypothetical Mmax Sensitivity Analysis Comparison for STP 3 & 4

| | **Original [FSAR] Soil GMRS** | **GMRS for 1 Hypothetical Mmax Distributions** | | | **% Diffs of Hypothetical GMRS from Original GMRS** | | |
|---|---|---|---|---|---|---|---|
| **Frequency (Hz)** | **Sa(g)** | **#1 Sa(g)** | **#2 Sa(g)** | **#3 Sa(g)** | **#1 %** | **#2 %** | **#3 %** |
| 100 | 0.0975 | 0.1003 | 0.1077 | 0.1143 | 3% | 10% | 17% |
| 25 | 0.1024 | 0.1054 | 0.1138 | 0.1212 | 3% | 11% | 18% |
| 10 | 0.1374 | 0.1413 | 0.1508 | 0.1593 | 3% | 10% | 16% |
| 5 | 0.1887 | 0.1933 | 0.2032 | 0.2123 | 2% | 8% | 13% |
| 2.5 | 0.2059 | 0.2094 | 0.2155 | 0.2213 | 2% | 5% | 7% |
| 1 | 0.1705 | 0.1723 | 0.1742 | 0.1763 | 1% | 2% | 3% |
| 0.5 | 0.1633 | 0.1639 | 0.1643 | 0.1649 | 0% | 1% | 1% |

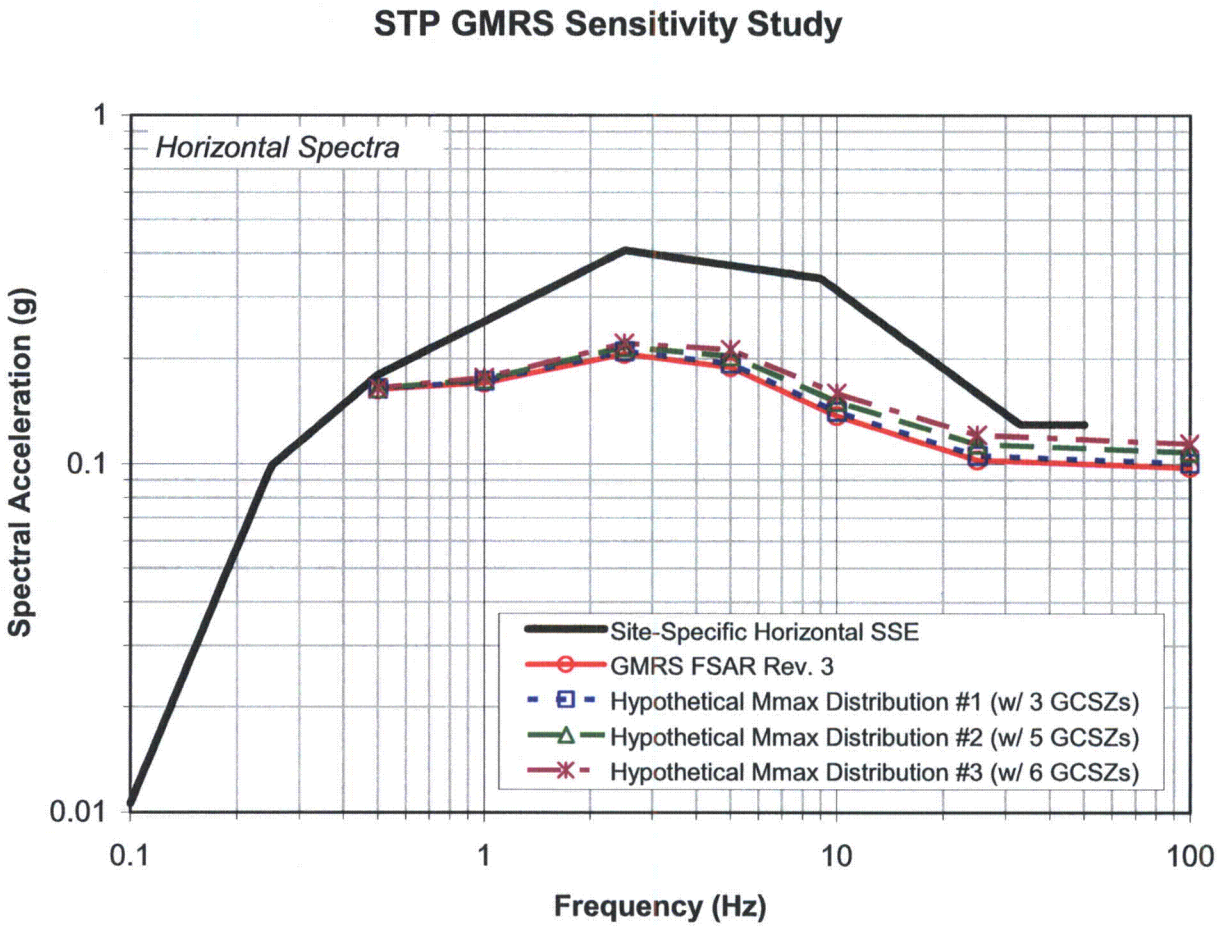


**Figure 2**. STP 3 & 4 FSAR and hypothetical soil GMRS corresponding to the values taken from Table 2. Also shown is the horizontal site-specific SSE response spectrum (STP 3 & 4 FSAR Figure 3H.6-1). All spectral accelerations are for 5% critical damping.

Conclusions

At the request of the NRC, the results of three sensitivity analyses cases that explore the effect of giving more weight to the possibility of larger maximum earthquakes in the Gulf of Mexico region than discussed in the STP 3 & 4 COLA are summarized in Table 2 and Figure 2.

As discussed with the NRC and presented in previous RAI responses, the Mmax distributions on which the GMRS presented in the COLA is based were developed in accordance with NUREG/CR-6372 and RG 1.208. That development included input from a highly qualified Peer Review Panel (PRP). Therefore, the COLA provides an acceptable and appropriate Mmax for the STP 3 & 4 site that satisfies NRC regulations.

For the requested sensitivity analyses, the impact of a hypothetical Mmax distribution was imposed on three (Case 1), five (Case 2) and all six (Case 3) Gulf Coastal Source Zones (GCSZs). None of these three cases is technically supportable under NRC guidance because imposing the hypothetical Mmax distribution: 1) does not meet the rigor of a SSHAC process as described in NUREG/CR-6372; and 2) is not consistent with the guidance presented in RG 1.208. Case 2 and Case 3 also are unsupportable because they would base the Mmax distributions for two (Case 2) or three (Case 3) of the GCSZs on an earthquake that did not occur in or near those GCSZs.

In addition, imposing the hypothetical, uniform Mmax distribution on most or all of the GCSZs significantly reduces the epistemic uncertainty in the GCSZ characterizations by removing the independent interpretations of the Earth Science Teams, and thus degrades the SSHAC Level 4-equivalent characteristics of the EPRI-SOG model. Nevertheless, in each sensitivity analysis case performed, Table 2 shows, as expected, an increase in the resultant soil GMRS when compared to the GMRS in the STP 3 & 4 COLA due to the higher magnitudes of the hypothetical Mmax distribution.

The results for Case 1, which considers the September 2006 earthquake only in the zones where it occurred, show only 0 to 3% GMRS increases in the 0.5 to 100 Hz (PGA) frequency range. This comparison between the Case 1 results and the COLA GMRS quantifies the impact of the hypothetical Mmax distribution requested by the NRC on the STP 3 & 4 GMRS.

The Case 2 and 3 sensitivity results depart further from regulatory guidance and have higher GMRS values, but all three sensitivity analysis cases result in hypothetical soil GMRS values that are below the site-specific horizontal SSE response spectrum as shown in Figure 2.

For these reasons, STP believes there is no safety impact identified in the evaluation of the differences between STP's updated Mmax distributions for the GCSZs and the three hypothetical cases studied. Therefore, the update of the Mmax distribution as described in STP 3 & 4 FSAR Subsection 2.5S.2.4.3 and implemented in the development of the GMRS in STP 3 & 4 FSAR Subsection 2.5S.2.6 is appropriate and reasonable.

No COLA revision is required as a result of this RAI response.

**References:**

Bird, D., Burke, K., Hall, S.A., and Casey, J.F., 2005, Gulf of Mexico Tectonic History: Hotspot Tracks, Crustal Boundaries, and Early Salt Distribution: AAPG Bulletin, V. 89, P. 311-328.

EPRI, 1986-1989, Seismic Hazard Methodology for The Central And Eastern United States (NP-4726), Vol. 1-3 & 5-10, EPRI.

Hall, S.A., and Najmuddin, I.J., 1994, Constraints on The Tectonic Development of the Gulf of Mexico Provided by Magnetic Anomaly Data: Journal of Geophysical Research, v. 99, p. 7161-7175.

Marton, G., and Buffler, R.T., 1994, Jurassic Reconstruction of the Gulf Of Mexico Basin: International Geology Review, v. 36, p. 545-586.

NRC, 2007, Regulatory Guide 1.208: A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion, US NRC

NUREG/CR-6372, Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts, Budnitz, R.J., Apostolakis, G., Boore, D.M., Cluff, L.S., Coppersmith, K.J., Cornell, C.A., and Morris, P.A., 1997, Washington, D.C., US NRC

Pindell, J., Kennan, L., and Barrett, S., 2000, Putting it all together again: AAPG Explorer, v. 21, October.

Sawyer, D.S., Buffler, R.T., and Pilger, R.H., 1991, The crust under the Gulf of Mexico basin, in Salvador, A., ed., The Gulf of Mexico Basin, Volume J: Boulder, Geological Society of America, p. 53-72.

South Texas Project Nuclear Operating Company. STP 3 & 4 Final Safety Analysis Report. Rev. 3.

The STP GMRS Sensitivity Study Source Zone Locations are shown in Tier 2, Part 2, Figure 2.5S.2-8:

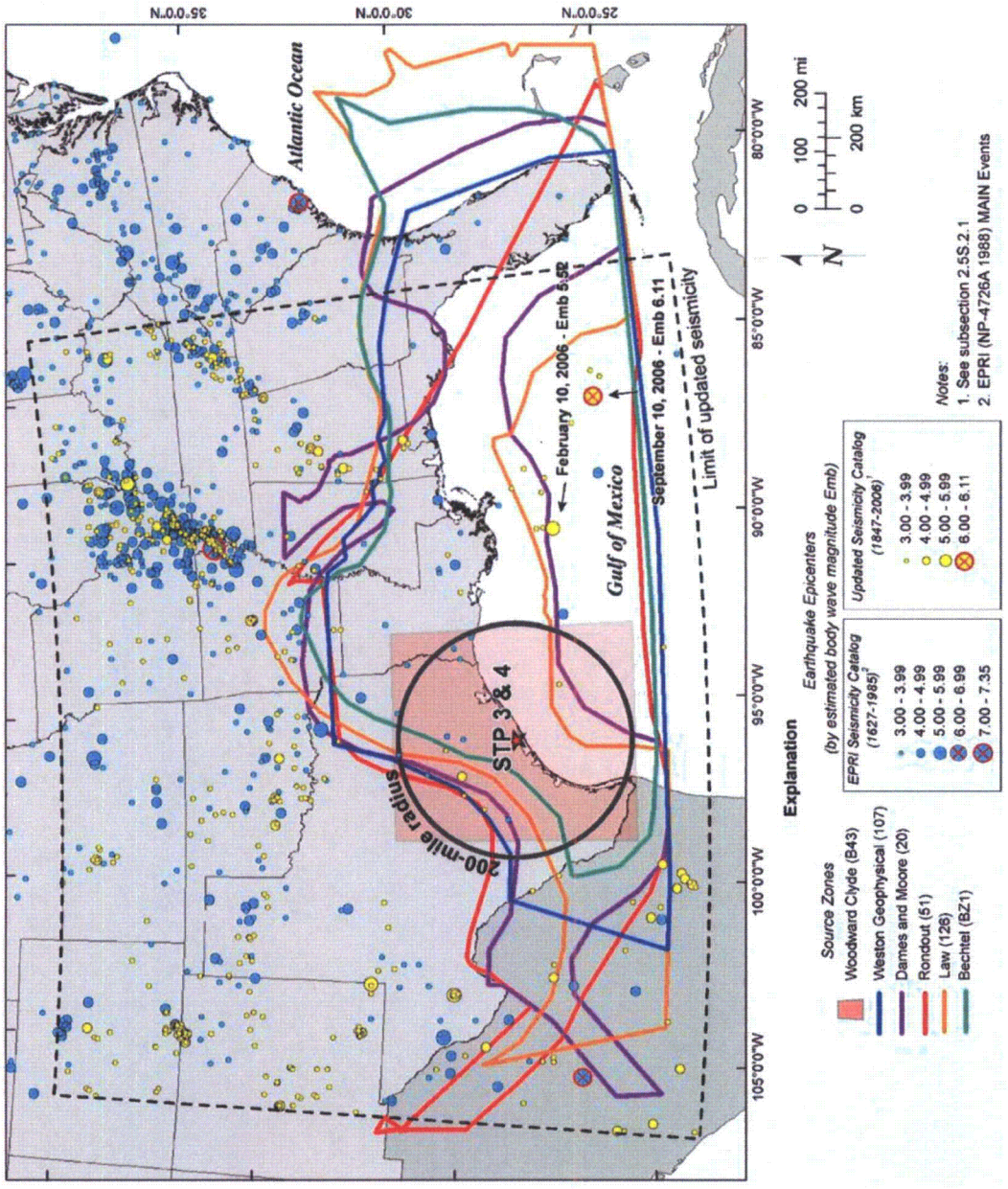


**Figure 2.5S.2-8 EPRI EST Gulf Coast Background Source Zones**

The revised schedule for responding to RAI letter number 333 provided below replaces the schedule provided in STPNOC Letter U7-C-STP-NRC-100107, dated May 17, 2010, and documents the scheduled agreed upon with the NRC during a teleconference on June 2, 2010.

| RAI Question | Reason for Extension | Response Date |
|---|---|---|
| 02.04.12-38, Supplement 1 | Develop a supplemental response to address NRC Audit issues and confirm consistency of changes in the geometric mean hydraulic conductivity values. | 8/30/2010 |
| 02.04.12-39 | Complete evaluation of post-construction conditions in the Groundwater Model. | 8/30/2010 |
| 02.04.12-40 | Complete validation runs of the Groundwater Model results. | 8/30/2010 |
| 02.04.12-42 | Perform sensitivity analysis of the Groundwater Model.<br>(Qualitative Response)<br>(Final Response) | <br>8/30/2010<br>12/15/2010 |
| 02.04.12-43 | Perform sensitivity analysis of the impact of dry cells on the Groundwater Model results. | 8/30/2010 |
| 02.04.12-44 | Perform sensitivity analysis of the impact of flooded cells on the Groundwater Model results. | 8/30/2010 |
| 02.04.12-45, Supplement 1 | Preparation of a supplemental response to address NRC Audit issues and perform sensitivity analysis and evaluation of the Groundwater Model. | 8/30/2010 |
| 02.04.12-46 | Complete Groundwater Model evaluation and perform sensitivity analysis.<br>(Qualitative Response)<br>(Final Response) | <br>8/30/2010<br>12/15/2010 |
| 02.04.12-47 | Complete Groundwater Model sensitivity analysis.<br>(Qualitative Response)<br>(Final Response) | <br>8/30/2010<br>12/15/2010 |
| 02.04.12-48 | Perform sensitivity analysis of the relief well operation on the groundwater levels and model the CFRW. | 8/30/2010 |
| 02.04.12-48 | Complete evaluation of the Groundwater Model (i.e., model ground cover and recharge)<br>(Qualitative Response)<br>(Final Response) | <br>8/30/2010<br>12/15/2010 |
| 02.04.12-49 | Complete evaluation of the Groundwater Model and perform sensitivity analysis.<br>(Qualitative Response)<br>(Final Response) | <br>8/30/2010<br>12/15/2010 |
| 02.04.12-50 | Complete evaluation of the Groundwater Model and perform sensitivity analysis.<br>(Qualitative Response)<br>(Final Response) | <br>8/30/2010<br>12/15/2010 |