

PSEGSPeRAIPEm Resource

From: Chowdhury, Prosanta
Sent: Monday, December 12, 2011 4:32 PM
To: 'PSEGRAIResponses@pseg.com'
Cc: PSEGSPeRAIPEm Resource; 'James.Mallon@pseg.com'; 'David.Robillard@pseg.com'; Segala, John; Silvia, Andrea; Clark, Phyllis; Canova, Michael; McLellan, Judith; Seber, Dogan; Devlin, Stephanie; Karas, Rebecca
Subject: PSEG Site ESPA FINAL RAI 43 (eRAI 6162) SRP-02.05.02 (RGS1)
Attachments: PSEG Site ESPA Final RAI 43 (eRAI 6162).pdf

Please find attached RAI 43 for the PSEG Site ESP Application. Following issuance of the draft of RAI 43 on November 14, 2011, a telecon was held on December 12, 2011, to provide clarification on Questions 02.05.02-4, 02.05.02-5, and 02.05.02-9(a), as requested by PSEG on November 30, 2011. The staff provided clarification on (i) 02.05.02-4 regarding staff's reference to literature in general; (ii) 02.05.02-5 regarding adequacy of ESTs source models, including addressing the impact on the GMRS; and (iii) 02.05.02-9(a) regarding expectation on receiving calculation packages or their extensive summaries, including identification of proprietary information in the response. Following the clarification, we understand that you have no further questions on this specific RAI, and therefore, we are issuing this RAI as final with no changes made to it.

The schedule we have established for review of your application assumes technically correct and complete responses within 30 calendar days of receipt of RAIs; however, via an email on November 30, 2011, your requested extended response durations for several Questions in this RAI as summarized below:

- 02.05.02-1 (60 days)
- 02.05.02-2 (60 days)
- 02.05.02-4 (60 days)
- 02.05.02-5 (120 days)
- 02.05.02-9(a) (possibly more than 30 days)

We assume that response to Questions 02.05.02-3, 02.05.02-6, 02.05.02-7, and 02.05.02-8 will be submitted within 30 calendar days of receipt of the final RAI. Additionally, we are assuming that response to Question 02.05.02-9 will be submitted within 45 calendar days. After reviewing your request, we concluded that the above requested response durations are acceptable for this RAI. Please note, SSAR Section 2.5.2 review schedule will be adjusted with these extended response durations, and any impact the additional response times may have on the overall review schedule will be assessed. If this RAI cannot be responded to within the durations specified above, it is expected that the dates for receipt of response to specific Questions will be provided to the staff within the 30-calendar day period so that the staff can assess how this information will further impact the schedule.

If you have any questions, please contact me.

Prosanta Chowdhury
Project Manager
Licensing Branch 1 (LB1)
Division of New Reactor Licensing
Office of New Reactors
301-415-1647

Hearing Identifier: PSEG_Site_EarlySitePermit_RAI
Email Number: 92

Mail Envelope Properties (320204600EA7B9408FE833FF15E4FF7D7F5B61955E)

Subject: PSEG Site ESPA FINAL RAI 43 (eRAI 6162) SRP-02.05.02 (RGS1)
Sent Date: 12/12/2011 4:32:07 PM
Received Date: 12/12/2011 4:32:08 PM
From: Chowdhury, Prosanta

Created By: Prosanta.Chowdhury@nrc.gov

Recipients:

"PSEGESPeRAIPEm Resource" <PSEGESPeRAIPEm.Resource@nrc.gov>

Tracking Status: None

"James.Mallon@pseg.com" <James.Mallon@pseg.com>

Tracking Status: None

"David.Robillard@pseg.com" <David.Robillard@pseg.com>

Tracking Status: None

"Segala, John" <John.Segala@nrc.gov>

Tracking Status: None

"Silvia, Andrea" <Andrea.Silvia@nrc.gov>

Tracking Status: None

"Clark, Phyllis" <Phyllis.Clark@nrc.gov>

Tracking Status: None

"Canova, Michael" <Michael.Canova@nrc.gov>

Tracking Status: None

"McLellan, Judith" <Judith.McLellan@nrc.gov>

Tracking Status: None

"Seber, Dogan" <Dogan.Seber@nrc.gov>

Tracking Status: None

"Devlin, Stephanie" <Stephanie.Devlin@nrc.gov>

Tracking Status: None

"Karas, Rebecca" <Rebecca.Karas@nrc.gov>

Tracking Status: None

"PSEGRAIResponses@pseg.com" <PSEGRAIResponses@pseg.com>

Tracking Status: None

Post Office: HQCLSTR01.nrc.gov

Files	Size	Date & Time
MESSAGE	2424	12/12/2011 4:32:08 PM
PSEG Site ESPA Final RAI 43 (eRAI 6162).pdf		57124

Options

Priority: Standard

Return Notification: No

Reply Requested: No

Sensitivity: Normal

Expiration Date:

Recipients Received:

Request for Additional Information No. 43

Application Revision 0

FINAL

12/12/2011

PSEG Site ESP
PSEG Power LLC, PSEG Nuclear LLC
Docket No. 52-043
SRP Section: 02.05.02 - Vibratory Ground Motion
Application Section: 2.5.2

QUESTIONS for Geosciences and Geotechnical Engineering Branch 1 (RGS1)

02.05.02-1

SSAR Subsection 2.5.2.4.2 describes revisions to the 1989 EPRI-SOG seismic source model. While the subsection discusses updates to the Charleston area seismic sources, it does not discuss updates to the New Madrid Seismic Zone (NMSZ). Even though the NMSZ is significantly away from the site, previous studies have shown that this source does impact seismic hazard at far distances. In compliance with 10 CFR 100.23 and in conformance to NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," please discuss quantitatively the impact of the NMSZ on the PSEG total seismic hazard curves and the site GMRS.

02.05.02-2

In SSAR Subsection 2.5.2.1.1 the applicant stated that the updated earthquake catalog covers an area bounded by 36° to 43° N and 71° to 80° W. This update area does not completely cover all of the EPRI seismic sources the applicant used in their hazard calculations. In compliance with 10 CFR 100.23 and in conformance to NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," please

- a. justify the use of a limited spatial extent in your earthquake catalog update for the PSEG site. Please describe how you account for the impacts of any potential earthquakes occurring since 1985 within the EPRI sources you used, but outside of the update area; provide information on any moderate to larger size earthquakes in these regions that might potentially impact seismic source parameters (such as Mmax and probability of activities) used in the hazard calculations.
- b. correct and/or resolve the conflict in SSAR Figures 2.5.2-3 and 2.5.2-5 through 2.5.2-10, which show a different update area than what is stated in the SSAR Subsection 2.5.2.1.1.

02.05.02-3

In Tables 2.5.2.-203 through 2.5.2-208 the applicant listed seismic sources that contribute more than 1% of the total hazard at the PSEG site. It is not clear to the staff if these contributing sources are based on the results of the original EPRI PSHA study or they are based on the results of the applicant's own assessments conducted using the updated ground motion prediction models and the latest PSEG earthquake catalog. In compliance with 10 CFR 100.23 and in conformance to NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," please discuss whether these sources were selected using the original ground motion prediction equations and the original earthquake catalog or the most recent EPRI 2004 and 2006 ground motion prediction equations and the updated PSEG earthquake catalog. If it is the former, discuss why you concluded that changes in ground motion prediction models and/or the updated catalog would not result in higher hazard contributions from some of the unused seismic sources which will make them viable sources to be used in the site PSHA study.

02.05.02-4

In accordance with NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," the most up-to-date information available in the scientific literature should be considered as part of PSEG's ESP application. SSAR Subsection 2.5.2.2.2 discusses Post-EPRI-SOG seismic source zone characterization studies. Please address the following:

a. SSAR Subsection 2.5.2.2.2 states that while the latest USGS PSHA study used new seismic model parameters for their Charlevoix seismic source, such as a lower b value, the EPRI-SOG source model was not updated because this update does not represent new information. In recent years, however, there has been significant new information on the nature of the Charlevoix and St. Lawrence rift seismic sources which might require updates to the original EPRI model. Please describe new findings described in the literature since the EPRI model and discuss how this new knowledge impacts the seismic hazard curves calculated for the PSEG site. Additionally, address the effect of the 1988 Saguenay M5.9 earthquake and its potential relationship to the Charlevoix and St. Lawrence rift seismic sources and source zone updates.

b. New information is also available regarding potential updates to seismic sources in the New England area. Please describe the new findings in the literature since the EPRI model and discuss how this new knowledge impacts the seismic hazard curves calculated for the PSEG site.

02.05.02-5

In compliance with 10 CFR 100.23 and in conformance to NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," please assess the adequacy of the existing EPRI-SOG seismic source model in light of the August 23, 2011 M5.8 Mineral, Virginia earthquake. The earthquake was located in the Central Virginia Seismic Zone, which is modeled by all of the EPRI-SOG

ESTs except for the Law Engineering Team. Please review the adequacy of each of the ESTs source models that incorporate this earthquake (including the Law Engineering Team) in terms of the maximum magnitude probability distribution, source geometry, probability of activity, and seismicity rates. In addition, please address the impact on the GMRS and update the tectonic description of the Central Virginia Seismic Zone in SSAR Subsection 2.5.1.1.4.2.5.1.

02.05.02-6

In regards to eliminating duplicate events in the updated earthquake catalog developed for the PSEG site, the SSAR Subsection 2.5.2.1.2 states "For events that occurred in a short time window in the same area, the largest event was retained." In compliance with 10 CFR 100.23 and in conformance to NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion, please clarify specifically what the terms "short time window" and "same area" refer to.

02.05.02-7

SSAR Subsection 2.5.2.4.2.1 states that "Seismic hazard generally has an important contribution from earthquakes within 100km (62 mi.) of a site, and the test area captures this distance and also the seismicity to the northeast." However, the test area shown in Figure 2.5.2-2 does not completely cover the 100 km area from the site. In compliance with 10 CFR 100.23 and in conformance to NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," please clarify the quoted statement above.

02.05.02-8

SSAR Figure 2.5.2-11 shows comparisons of recurrence calculations obtained using the original EPRI and the updated PSEG earthquake catalogs in a test zone. The figure shows the results of recurrence calculations between magnitudes 5 and 7. However, in the EPRI 1989 PSHA methodology, the recurrence calculations are conducted using magnitudes 3 and above. In compliance with 10 CFR 100.23 and in conformance to NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG) 1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion," please confirm that the actual calculations were conducted using the catalog earthquakes with magnitudes 3 and above.

02.05.02-9

The staff had an opportunity to briefly review several calculation packages developed to support the PSEG PSHA calculations during its site audit conducted on September 29-30, 2011. In accordance with NUREG-0800, Standard Review Plan, Section 2.5.2, "Vibratory Ground Motion," and Regulatory Guide (RG)

1.208, "A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion,"

a. to enable the staff to fully evaluate the technical details of the calculations presented therein, please provide copies of the following calculation packages or provide extensive summaries of the calculation packages, which includes descriptions of objectives, inputs, assumptions, procedures, calculations, analyses, figures, tables, and/or results where necessary.

- #2251-ESP-REI-2047-ACR-034 "Calculation of Site Response for the PSEG site".

- #2251-ESP-REI-2047-ACR-040 "Calculation of Smooth Vertical GMRS for the PSEG site".

- #2251-ESP-REI-2047-ACR-044 "Replication of 1989 EPRI-SOG Hazard for Individual Law Engineering Sources".

- #2251-ESP-REI-2047-ACR-014 "PSEG Site Hazard Contribution by Source".

- #2251-ESP-REI-2047-ACR-046 "Sensitivity of Site Amplification Factors for the PSEG Site ESP to Revisions in Degradation Curves".

b. Calculation Package # 2047-ACR-005 states that large seismic sources were modified to include only portions of them up to 500km distance from the PSEG site for computational efficiency. Please justify why this simplification is adequate. Has there been any sensitivity study showing the impacts of such simplifications on the total hazard curves?