## PMHarrisCOL PEmails

**From:** Manny Comar
**Sent:** Friday, September 26, 2008 8:38 AM
**To:** robert.kitchen@pgnmail.com; david.waters@pgnmail.com; Wilkins, Tillie
**Cc:** Manny Comar; HarrisCOL Resource
**Subject:** REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 018 RELATED TO SRP SECTION 02.05.02 FOR THE HARRIS UNITS 2 AND 3 COMBINED LICENSE APPLICATION
**Attachments:** Harris-RAI-LTR-18.pdf

All:

Attached is the RAI letter No.18 related to SRP Section: 02.05.02 - Vibratory Ground Motion

The Accession number is ML082690551.

If you have any further questions, please feel free to contact me. Thanks

Manny Comar
Senior Project Manager
NRO/DNRL/NWE1
Nuclear Regulatory Commission
301-415-3863
mailto:manny.comar@nrc.gov

**Hearing Identifier:** ShearonHarris_COL_Public
**Email Number:** 99

**Mail Envelope Properties** (3AF7DEF82ADA8944AD8247B7ED7FD6517BF8FE76BB)

**Subject:** REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 018 RELATED TO SRP SECTION 02.05.02 FOR THE HARRIS UNITS 2 AND 3 COMBINED LICENSE APPLICATION
**Sent Date:** 9/26/2008 8:37:36 AM
**Received Date:** 9/26/2008 8:37:40 AM
**From:** Manny Comar

**Created By:** Manny.Comar@nrc.gov

**Recipients:**
"Manny Comar" <Manny.Comar@nrc.gov>
Tracking Status: None
"HarrisCOL Resource" <HarrisCOL.Resource@nrc.gov>
Tracking Status: None
"robert.kitchen@pgnmail.com" <robert.kitchen@pgnmail.com>
Tracking Status: None
"david.waters@pgnmail.com" <david.waters@pgnmail.com>
Tracking Status: None
"Wilkins, Tillie" <tillie.wilkins@pgnmail.com>
Tracking Status: None

**Post Office:** HQCLSTR01.nrc.gov

| **Files** | **Size** | **Date & Time** |
|---|---|---|
| MESSAGE | 414 | 9/26/2008 8:37:40 AM |
| Harris-RAI-LTR-18.pdf | 167720 | |

**Options**
**Priority:** Standard
**Return Notification:** No
**Reply Requested:** No
**Sensitivity:** Normal
**Expiration Date:**
**Recipients Received:**

## HarrisRAIsPEm Resource

**From:** Manny Comar
**Sent:** Thursday, September 25, 2008 2:07 PM
**To:** HarrisRAIsPEm Resource
**Subject:** REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 018 RELATED TO SRP SECTION 02.05.02 FOR THE HARRIS UNITS 2 AND 3 COMBINED LICENSE APPLICATION
**Attachments:** HAR-RAI-LTR-018.doc

**Hearing Identifier:** HarrisCOL_eRAIs
**Email Number:** 18

**Mail Envelope Properties** (3AF7DEF82ADA8944AD8247B7ED7FD6517BF8FE71B6)

**Subject:** REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 018 RELATED TO SRP SECTION 02.05.02 FOR THE HARRIS UNITS 2 AND 3 COMBINED LICENSE APPLICATION
**Sent Date:** 9/25/2008 2:06:39 PM
**Received Date:** 9/25/2008 2:06:40 PM
**From:** Manny Comar

**Created By:** Manny.Comar@nrc.gov

**Recipients:**
"HarrisRAIsPEm Resource" <HarrisRAIsPEm.Resource@nrc.gov>
Tracking Status: None

**Post Office:** HQCLSTR01.nrc.gov

| **Files** | **Size** | **Date & Time** |
|---|---|---|
| MESSAGE | 13 | 9/25/2008 2:06:40 PM |
| HAR-RAI-LTR-018.doc | 67066 | |

**Options**
**Priority:** Standard
**Return Notification:** No
**Reply Requested:** No
**Sensitivity:** Normal
**Expiration Date:**
**Recipients Received:**

September 25, 2008

James Scarola
Senior Vice President and
Chief Nuclear Officer
PO Box 1551
411 Fayetteville Street Mall
Raleigh NC 27602

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO. 018 RELATED TO SRP SECTION 02.05.02 FOR THE HARRIS UNITS 2 AND 3 COMBINED LICENSE APPLICATION

Dear Mr. Scarola:

By letter dated February 18, 2008, Progress Energy submitted its application to the U. S. Nuclear Regulatory Commission (NRC) for a combined license (COL) for two AP1000 advance passive pressurized water reactors pursuant to 10 CFR Part 52. The NRC staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within 30 days of the date of this letter. If changes are needed to the final safety analysis report, the staff requests that the RAI response include the proposed wording changes.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3863.

Sincerely,

/**RA**/

Manny Comar, Lead Project Manager
AP1000 Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-022
52-023
ERAI Tracking No.1192

Enclosure:
Request for Additional Information

CC: see next page

If you have any questions or comments concerning this matter, you may contact me at 301-415-3863.

Sincerely,

/**RA**/

Manny Comar, Lead Project Manager
AP1000 Projects Branch 1
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-022
52-023
ERAI Tracking No. 1192

Enclosure:
Request for Additional Information

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NRO-002

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|---|---|---|---|---|
| NAME | RKaras* | MComar* | SBrock* | MComar* |
| DATE | 9/5/08 | 9/10/08 | 9/15/08 | 9/25/08 |

*Approval captured electronically in the electronic RAI system.

**OFFICIAL RECORD COPY**

Request for Additional Information No. 1192

9/25/2008
Shearon Harris
Progress Energy Carolinas, Inc.
Docket No. 52-022 and 52-023
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
Section 2.5.2.1.1 does not provide any information on how $m_b$ magnitudes were calculated for earthquakes added to the EPRI catalog. Please describe the methodology used to determine $m_b$ magnitudes for all seismic events added either to extend or to update the original EPRI catalog.

02.05.02-2
Section 2.5.2.1.1 states that seismic moments are listed in the table provided in Appendix 2AA. However, the table in Appendix 2AA does not include any moment values. Please update the catalog by adding moment magnitudes and the seismic moment values mentioned and provide an electronic copy of the final earthquake catalog.

02.05.02-3
Section 2.5.2.4.1.2 states that adjusted magnitudes, $m_b$*, were used in computing earthquake recurrence parameters. However, the seismic catalog provided in Appendix 2AA also introduces a term called "Final $m_b$". The distinction between the definitions of "$m_b$*" and "Final $m_b$" listed in the catalog is not clear. Please explain the differences in these two notations.

02.05.02-4
Section 2.5.2.1.2 describes the uncertainty associated with the location of one of the significant earthquakes, the January 8, 1817, event with an estimated magnitude $m_b$ = 5.0, identified in the HAR earthquake catalog. The EPRI catalog places this event about 145 km to the west of the HAR site. However, the location was significantly revised by later studies. The NCEER-91 (National Center for Earthquake Engineering Research) Catalog places this event off shore about 1000km east of the HAR site. Yet, the USGS catalog places it near Charleston, about 300 km south of the HAR site. You used the USGS location in your safety analysis. However, this location appears to be in conflict with the earthquake's felt area reports. While the felt area from this earthquake, as reported in Section 2.5.2.1.2, stretches from Milledgeville, GA, to Baltimore, MD, this reassigned location near Charleston is significantly closer to the southern end of the felt area. The northern end of the felt area is about

800km away from this location. Please provide further justification for relocating this event in the Charleston area and discuss how you account for this apparent discrepancy between the epicenter location and the felt area reports. Given the uncertainty in the location of this event, also provide a discussion about the potential impact on hazard at the HAR site, if the location were to be at the approximate center of the felt area, as it is normally observed in felt area/earthquake location studies.

02.05.02-5

Section 2.5.2.1.2 describes the justification for relocating one of the significant earthquakes, the February 21, 1916, event with a magnitude mb=5.0, to about 100km west of its current location, placing it further away from the HAR site and cites a personal communication with Dr. Chapman of Virginia Tech as the rationale. However, the Southeastern U.S. Earthquake Catalog (http://www.geol.vt.edu/outreach/vtso/anonftp/catalog/susn2006cat.txt) maintained by the Virginia Tech Seismological Laboratory for which Dr. Chapman is the Director, lists this event as occurring at 35.5N, 82.5W which is the former location also identified in the EPRI and NCEER-91 catalogs. Please explain this discrepancy.

02.05.02-6

In Section 2.5.2.4.2.1, you stated that "As presented in Subsection 2.5.2.4.4, large-magnitude earthquakes at very small distances are not a significant contributor to the hazard". The referenced subsection (Subsection 2.5.2.4.4) does not include much discussion on this issue. Please explain in detail what you meant by this statement.

02.05.02-7

In Section 2.5.2.5 you indicated that "Based on the seismic reflection data shown on Figure 2.5.1-241, the estimated thickness of the Triassic sediments at the HAR site is 1524 m (5000ft.)". Please explain how this depth was calculated.

02.05.02-8

The line-drawings shown in Figure 2.5.1-241 represent interpretations of the seismic reflection data. Please provide a copy of the original seismic reflection data for the staff to be able to assess the interpretations shown in the figure.

02.05.02-9

In Section 2.5.2.4.1.3, you stated that "The minimum values for a few of these (magnitude) distributions (sources 107 and 217 defined by Law Engineering and sources C18 and 103 defined by Weston Geophysical) were adjusted to be consistent with the largest observed earthquake in these sources".

While the changes for the Law Engineering team are shown on Table 2.5.2-203, the changes made to the Weston Geophysical model are not shown in Table 2.5.2-205. Please update the table and provide a copy of the revised table.

02.05.02-10
In Section 2.5.2.4.2.1, you showed that while there is a good overall agreement with the EPRI ground motion models and the updated Atkinson and Boore (2006) model (Figure 2.5.2-221), the updated Atkinson and Boore (2006) model spectral acceleration values are about 35-40% higher at distances of about 300 kilometers compared to the mean EPRI ground motion predictions. Since this is the approximate distance to the Charleston source area and given the large contribution of the Charleston source to the seismic hazard at the Harris site, please discuss the impact of not using the updated Atkinson and Boore (2006) model on the hazard curves.

02.05.02-11
In Section 2.5.2.4.2.1, you compared the impacts of new ground motion models proposed since the publication of the EPRI 2004 models. However, you did not include a 2005 Eastern North America ground motion prediction model developed by Tavakoli and Pezeshk (BSSA, 2005, v.95[6], 2283-2296) in your sensitivity analysis. Please provide comparative charts showing the differences between the ground motions calculated with this new model and the other models used in the HAR study.

02.05.02-12
Section 2.5.2.5 describes the seismic wave transmission characteristics beneath the HAR site and outlines the geometry of the Deep River basin. As seen from Figures 2.5.1-241, 2.5.4-204, 2.5.4-205 the Deep River basin and the shallow structures beneath the HAR site exhibit strong three dimensional geometries. However, your site response analyses did not take into account the effects of basin geometries and the near-surface three dimensional structures on the seismic wave propagation and amplification. Please provide justification for excluding the three-dimensional nature of the subsurface structure in your site response analysis.

02.05.02-13
In Section 2.5.2.5.1.4, you stated that two alternative sets of modulus reduction and damping relationships were used in the site response analysis for the HAR site. Please provide further justification of why the Peninsula Ranges modulus reduction and damping relationships are considered appropriate for the HAR site response analysis.

02.05.02-14
In section 2.5.2.5.1.4, you stated that "The $\kappa$ values are reduced by an additional 0.0002 second to account for the effects of scattering due to randomization of the velocity profiles". Please explain the

basis for this reduction value of 0.0002 sec. Is this number based on any scientific study results, or is it a best estimate value?

02.05.02-15
Section 2.5.2.6 provides a table (Table 2.5.2-221) showing the spectral acceleration ratios computed with CAV and no-CAV filters. The table lists ratios greater than 1.0 for the $10^{-6}$ Probability of Exceedance values at frequencies of 10, 25, and 100Hz. Please provide an explanation of why the surface UHRS with CAV would produce higher amplitudes in spectral acceleration.

02.05.02-16
Please provide the boundary coordinates of the seismic sources used for the HAR PSHA calculations in electronic format. Please also provide the calculated mean hazard curves for 0.5, 1, 2.5, 5, 10, 25, and 100 Hz along with their 5%, 16%, 50%, 84%, and 95% percentiles in electronic format.

02.05.02-17
Please provide soil hazard curves electronically for $10^{-4}$, $10^{-5}$, and $10^{-6}$ annual exceedance frequencies as well as in between annual exceedance values for the staff to be able to conduct detailed performance-based confirmatory analysis.

02.05.02-18
The staff also noticed the following discrepancies in Section 2.5.2:

- Section 2.5.2.1.1 states that the Appendix (2AA) lists 225 earthquakes that are within 325 km of the HAR site. Appendix 2AA actually lists 1329 events covering the entire CEUS regions.
- Section 2.5.2.4.1.2 states that updated estimates of the occurrence rates for these earthquakes based on paleoliquefaction data are described in Subsection 2.5.2.4.1.1.1. The information is actually located in Section 2.5.1.1.4.3
- The April 29, 1852, earthquake was felt at Buckingham and Wytheville, Virginia, not in S. Carolina as indicated in FSAR.
- Postulated East Coast Fault System (green outlined area according to figure caption) cannot be seen on Figure 2.5.2-214.