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UniStar
NUCLEAR ENERGY

10 CFR 50.4
10 CFR 52.79

April 30, 2010

UN#10-124

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: UniStar Nuclear Energy, NRC Docket No. 52-016
Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3,
RAI 219, Response to Questions 02.05.01-63 through 65,
Basic Geologic and Seismic Information

Reference:

1) Surinder Arora (NRC) to Robert Poche (UniStar Nuclear Energy), "FINAL RAI 219 RGS2 4162" email dated March 20, 2010

2) UniStar Nuclear Energy Letter UN#10-114, from Greg Gibson to Document Control Desk, U.S. NRC, Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI 219, Questions 02.05.01-63 through 69, Basic Geologic and Seismic Information, dated April 21, 2010.

The purpose of this letter is to respond to the request for additional information (RAI) identified in the NRC e-mail correspondence to UniStar Nuclear Energy, dated March 20, 2010 (Reference 1). This RAI addresses Basic Geologic and Seismic Information, as discussed in Section 2.5.1 of the Final Safety Analysis Report (FSAR), as submitted in Part 2 of the Calvert Cliffs Nuclear Power Plant (CCNPP) Unit 3 Combined License Application (COLA), Revision 6.

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Reference 2 provided a schedule of April 30, 2010 for the response to Questions 02.05.01-63, 64 and 65, and a response date of May 20, 2010 for the response to Questions 02.05.01-66, 67, 68 and 69.

The Enclosure provides responses to RAI 219, Questions 02.05.01-63, 64 and 65. A Licensing Basis Document Change Request has been initiated to incorporate these changes into a future revision of the COLA.

There are no regulatory commitments identified in this letter. This letter does not contain any proprietary or sensitive information.

If there are any questions regarding this transmittal, please contact me at (410) 470-4205, or Mr. Wayne A. Massie at (410) 470-5503.

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

Executed on April 30, 2010

Greg Gibson

Enclosure: Response to NRC RAI 219, Questions 02.05.01-63, 64 and 65, Calvert Cliffs Nuclear Power Plant, Unit 3

cc: Surinder Arora, NRC Project Manager, U.S. EPR Projects Branch
Laura Quinn, NRC Environmental Project Manager, U.S. EPR COL Application
Getachew Tesfaye, NRC Project Manager, U.S. EPR DC Application (w/o enclosure)
Loren Plisco, Deputy Regional Administrator, NRC Region II (w/o enclosure)
Silas Kennedy, U.S. NRC Resident Inspector, CCNPP, Units 1 and 2
U.S. NRC Region I Office

GTG/SJS/mdf

Enclosure

Response to NRC RAI 219, Questions 02.05.01-63, 64 and 65,

Calvert Cliffs Nuclear Power Plant Unit 3

RAI 219

Question 02.05.01-63

In FSAR section 2.5.1.1.4 "Regional Tectonic Setting", the global review of earthquakes in SCRs based on Johnston, et al (1994) evaluation of 870 earthquakes in SCRs was cited and discussed. In RAI 02.05.01-3 the NRC staff pointed out that the FSAR does not include the analysis of Schulte and Mooney, (2005), a significant rework and analysis of the same issue with respect to earthquakes in SCRs that post-dates the Johnston et al (1994) study and which also includes 503 additional earthquakes. NRC asked the applicant to provide a discussion of the relevance of the Schulte and Mooney, (2005), paper for the CCNPP site. In response to RAI 02.05.01-3 the applicant provided a discussion of both the Johnston, et al and the Schulte & Mooney papers stating that the Schulte and Mooney, 2005 conclusions are essentially the same as the Johnston et al, 1994 and did not contradict any of the Johnston, et al conclusions. The applicant stated that the Schulte and Mooney paper does not provide new information that motivates revisions to the EPRI-SOG source characterizations used for CCNPP.

NRC specifically requested a discussion of the Schulte and Mooney 2005 work as part of the characterization of the CCNPP site Regional Tectonic setting. Regardless of several similar conclusions to the earlier work, the Schulte Mooney paper presents a different perspective of study in that it presents the geological or tectonic relationship or association with seismicity as well as adding an additional 503 earthquakes to the overall evaluation. Please explain why you plan no future revision to FSAR to include a discussion of this study.

Response

FSAR Section 2.5.1.1.4 is revised to include a summary discussion of the Schulte and Mooney study presented in the response to RAI 71, Question 02.05.01-3.

COLA Impact

FSAR Section 2.5.1.1.4 is revised as follows: Note that this markup is to the FSAR text as provided in UniStar Nuclear Energy letter UN#09-389[1] October 2, 2009.

2.5.1.1.4 Regional Tectonic Setting

In 1986, the Electric Power Research Institute (EPRI) developed a seismic source model for the Central and Eastern United States (CEUS), which included the CCNPP site region (EPRI, 1986). The CEUS is a stable continental region (SCR) characterized by low rates of crustal deformation and no active plate boundary conditions. The EPRI source model included the independent interpretations of six Earth Science Teams and reflected the general state of knowledge of the geoscience community as of 1986. The seismic source models developed by each of the six teams were based on the tectonic

[1] G. Gibson (UniStar Nuclear Energy) to Document Control Desk (U.S. NRC), "Response to Request for Additional Information for the Calvert Cliffs Nuclear Power Plant, Unit 3, RAI No. 130, Basic Geologic and Seismic Information and RAI No. 134, Basic Geologic and Seismic Information" Letter UN#09-389, dated October 2, 2009.

setting and the occurrence, rates, and distribution of historical seismicity. The original seismic sources identified by EPRI (1986) are thoroughly described in the EPRI study reports (EPRI, 1986) and are summarized in Section 2.5.2.2.

Since 1986, additional geological, seismological, and geophysical studies have been completed in the CEUS and in the CCNPP site region. The purpose of this section is to summarize the current state of knowledge on the tectonic setting and tectonic structures in the site region and to highlight new information acquired since 1986 that is relevant to the assessment of seismic sources.

A global review of earthquakes in SCRs by Johnston et al. (Johnston, 1994) shows that areas of Mesozoic and Cenozoic extended crust are positively correlated with large SCR earthquakes. Nearly 70% of SCR earthquakes with M 6 occurred in areas of Mesozoic and Cenozoic extended crust (Johnston, 1994). Additional evidence shows an association between Late Proterozoic rifts and modern seismicity in eastern North America (Johnston, 1994) (Wheeler, 1995) (Ebel, 2002). Paleozoic and older crust extended during the Mesozoic underlies the entire 200 mi (322 km) CCNPP site region (Figure 2.5-15). The EPRI SOG ESTs were aware of the major conclusions of the Johnston et al. (1994) study – that there is a correlation between Mesozoic and Cenozoic extended crust and large SCR earthquakes. Thus, the findings of Johnston et al. (1994) are not considered new information that would prompt an update of the EPRI-SOG source characterization of the CCNPP COLA.

In a more recent study, Schulte and Mooney (Schulte, 2005) reassessed the correlation between earthquakes and extended and non-extended SCRs. Schulte and Mooney (Schulte, 2005) compiled an updated catalog of SCR earthquakes containing 1,221 earthquakes with magnitudes greater than or equal to Mw 4.5, approximately 58% more earthquakes than in the catalog used by Johnston et al. (Johnston, 1994). Schulte and Mooney (Schulte, 2005) then classified the earthquakes as having occurred in one of five different domains: interior rifts, rifted margins, non-rifted crust, possible interior rifts, and possible rifted margins. Based on their analysis of this classification, Schulte and Mooney (Schulte, 2005) made numerous observations and conclusions that largely support the conclusions of Johnston (Johnston, 1994). In particular, Schulte and Mooney (Schulte, 2005) concluded that:

- Extended SCR crust only has slightly more earthquakes with Mw > 4.5 than non-extended SCR crust; and
- The largest SCR earthquakes (Mw > 7.0) occur predominantly within the extended crust.

The reanalysis of earthquakes with respect to SCRs and extended crust by Schulte and Mooney (Schulte, 2005) supports the conclusions of Johnston (1994) and thus does not provide new information that would motivate an update or revision of the EPRI-SOG source model for this COLA.

As discussed in this section and determined from a comprehensive literature review, discussion with local and regional experts, field and aerial reconnaissance, and review of aerial photography and LiDAR data (See Subsection 2.5.1.1.4.4 for further details), no potential capable faults or tectonic -related features were identified within the site region. These findings are consistent with Crone (2000) and Wheeler (2005) that performed primarily a literature review of existing information for previously identified faults in the Central and Eastern United States. ~~However, as discussed in this section, there is no evidence for late Cenozoic seismogenic activity of any tectonic feature or structure in the site region (Crone, 2000) (Wheeler, 2005).~~ Although recent characterization of several tectonic features has modified our understanding of the tectonic evolution and processes of the mid Atlantic margin, no structures or features have been identified in the site region since 1986 that show clear evidence of seismogenic potential greater than what was recognized and incorporated in the EPRI study (EPRI, 1986) seismic source model. ~~A study by Schulte and Mooney (Schulte, 2005) reassessed the correlation between earthquakes and extended and non-extended SCRs using an updated SCR earthquake catalog. Based on their analysis, Schulte and Mooney made numerous observations and conclusions that largely support the conclusions of Johnston et al. (Johnston, 1994). In particular, Schulte and Mooney concluded that:~~

- ~~Extended SCR crust on has slightly more earthquakes than non-extended SCR crust, and~~
- ~~The largest SCR earthquakes (Mw > 7.0) occur predominantly within the extended crust~~

The following sections describe the tectonic setting of the site region by discussing the: (1) plate tectonic evolution of eastern North America at the latitude of the site, (2) origin and orientation of tectonic stress, (3) gravity and magnetic data and anomalies, (4) principal tectonic features, and (5) seismic sources defined by regional seismicity. Historical seismicity occurring in the site region is described in Section 2.5.2.1. The geologic history of the site region was discussed in Section 2.5.1.1.2.

The following reference is added to Section 2.5.1.3:

Schulte, 2005. An updated global earthquake catalogue for stable continental regions: reassessing the correlation with ancient rifts: Geophys. J. Int., v. 161, p. 707-721. S.M. Schulte, and W.D. Mooney, 2005

RAI 219

Question 02.05.01-64

FSAR Section 2.5.1.1.4, Regional Tectonic Setting, cites the Crone and Wheeler compiled database of Quaternary structures or features with potential seismogenic properties as the basis for the statement that there is no evidence for late Cenozoic seismogenic activity on any feature in the CCNPP region. In response to RAI 02.05.01-4 the applicant provided a detailed process of what they did to evaluate potential Quaternary faults and features near the site beyond the scope of the Crone and Wheeler compilation. The applicant described a multistep process that included: compilation and review of existing published and unpublished literature; phone and in-person interviews of regional and local experts (they provided a specific list of scientists); field and aerial reconnaissance, and review of aerial photography (5-mile radius), digital elevation maps, and LiDAR coverage.

Since Crone (2000) and Wheeler (2005) did not do the detailed field work described in the RAI response to evaluate the Quaternary features near the site, please explain why a summary of this important response is not planned to be integrated into a future revision of the FSAR.

Response

The FSAR will be revised to include a detailed description of the methodology for assessing potential Quaternary faults or tectonic features (described in response to RAI 71, Question 02.05.01-4) and a new figure showing the extent of the field and aerial reconnaissance performed for the CCNPP Unit 3 site COLA.

COLA Impact

FSAR Section 2.5.1.1.4.4 will be modified as follows:

2.5.1.1.4.4 Principal Tectonic Structures

Research since the EPRI study (EPRI, 1986) has advanced the understanding of the character and timing of the crustal architecture and tectonic history of the Atlantic continental margin. The research has explained the significance of many geophysical anomalies and has clarified the timing and kinematics of tectonic processes from the Late Precambrian through the Cenozoic. Since the EPRI study (EPRI, 1986) was completed, new Cenozoic tectonic features have been proposed and described in the site region, and previously described features have since been characterized in more detail. New features identified since the EPRI study (EPRI, 1986) in the CCNPP site region area include gentle folds and a hypothesized minor fault on the western shore of Chesapeake Bay directly south of the CCNPP site (Kidwell, 1997). Also, new geologic data collected since 1986 has clarified the geometry and location of the Port Royal fault zone and Skinkers Neck anticline, and tectonic features representing the southern continuation of the Brandywine fault system, all of which are discussed further in the following sections. Tectonic features suggested by poorly constrained data include an unnamed fault underlying the upper Chesapeake Bay inferred by Pazzaglia (Pazzaglia, 1993), a series of warps beneath the lower Patuxent River and Chesapeake Bay near the CCNPP site hypothesized by McCartan (McCartan, 1995), and a hypothesized Stafford fault system by Marple and Talwani (Marple, 2004b) that is significantly longer and more active than previously recognized (Mixon, 2000). An additional geologic feature discovered since EPRI (1986) in the site region is the Eocene Chesapeake Bay impact crater (Figure 2.5-5 and Figure 2.5-6) (King, 1974) (Schruben, 1994). Based on the absence of published literature documenting Quaternary tectonic deformation and spatially associated with seismicity, we conclude that this feature is not a capable tectonic source (Section 2.5.1.1.4.4.4).

In the sections below, specific tectonic features and their evidence ~~for~~ of Cenozoic activity published since the EPRI (1986) study are discussed. We find that no new information has been published since 1986 on any tectonic feature within the CCNPP site region that would cause a significant change in the EPRI seismic source model. These findings are based in part on a review of existing published literature by Crone and Wheeler (Crone, 2000) and Wheeler (Wheeler, 2005) (Wheeler, 2006), and studies performed for this COL. The investigation of potential Quaternary faults or features within the site vicinity included a multi-step process, including: (1) compilation and review of existing published and unpublished literature; (2) phone and in-person interviews of regional and local experts; (3) field and aerial reconnaissance, and (4) review of aerial photography (5-mile-radius), digital elevation maps, and LiDAR coverage. Each step included the following:

(1) The references of Crone (2000), Wheeler (2005), and Wheeler (2006), were used as screening tools to initially characterize and identify possible late Cenozoic structures within a 200-mi-radius of the site. The references listed in Crone (2000), Wheeler (2005), and Wheeler (2006) were obtained and reviewed for structures located within a 200-mile-radius, as well as a few located directly outside of the 200-mi-radius. An internal internet- and library-based reference search for authors and topics related to potential Cenozoic seismogenic structures along the East Coast of the United States was performed to capture studies that post-date Crone (2000) and Wheeler (2005)(2006), as well as references that the authors missed during their own compilation (e.g., Hansen and Edwards, 1986; Kidwell, 1997; McCartan et al., 1995; Pazzaglia, 1993).

(2) To complement the comprehensive literature search, UniStar geologists contacted regional and local experts with field experience in Virginia, Maryland, Pennsylvania, Washington, D.C. and Calvert County, Maryland. At the U.S. Geological Survey in Reston, Virginia, both in-person and over-the-phone interviews were performed with experts regarding previously known and unknown potential seismic sources in the region. Experts contacted to discuss their knowledge on the structural and geologic setting of Chesapeake Bay and the eastern seaboard of the United States included: Richard Harrison, David Russ, David Powars, Wayne Newell, Lucy McCartan, Wylie Poag, Milan Pavich, and Steve Schindler of the U.S. Geological Survey. In addition, UniStar geologists visited the Maryland Geological Survey (MGS) and discussed similar topics with John Wilson who provided references related to studies performed by former MGS geologist Harry Hansen. In-house experts, Scott Lindvall and Ross Hartleb, who worked on numerous similar nuclear-related sites in the southeast, were contacted to provide a summary of potential regional seismic sources (i.e., Charleston, etc.). In addition, UniStar geologists contacted Dr. Susan Kidwell to discuss a detailed biostratigraphy and basin analysis of the Miocene Coastal Plain

section exposed along Calvert Cliffs, and her basis for inferring a hypothetical fault at Moran Landing. Dr. Steve Obermier (retired from the U.S. Geological Survey) and Dr. Martitia Tuttle (an expert in paleoliquefaction investigations in the Central-Eastern United States) were contacted to discuss their knowledge of liquefaction-related features, if any, along the East Coast near the CCNPP site. UniStar also spoke with Martin Chapman of Virginia Tech, and Duane Braun of Bloomsberg University, Pennsylvania.

(3) To independently evaluate the information collected through the literature searches and interviews, UniStar conducted field reconnaissance of: (a) previously mapped geologic features and potential seismic sources within a 200-mi-radius of the site (e.g., Crone, 2000; Wheeler, 2005; Wheeler 2006), (b) site vicinity geomorphology and Quaternary geology with respect to neotectonic deformation, and (c) local cliff exposures for evidence of faulting and/or folding. Reconnaissance of key potential structures was conducted during and after consultation with local experts and literature review. Field reconnaissance was performed on the Stafford, Brandywine, Port Royal, Skinkers Neck, Mountain Run, Hazel Run, Fall Hill, Dumfries, Fall Line, Upper Marlboro, and Hillville fault zones. Field reviews of faults were followed by aerial reconnaissance. Dr. David Powars of the U.S. Geological Survey provided UniStar geologists with a tour of the Rock Creek fault zone and recent exposures of ancient gravels at the National Cathedral. The location of field stops and the aerial reconnaissance flight path are shown on Figure 2.5-301. UniStar geologists performed reconnaissance of several hypothesized faults/folds (Hansen, 1978; Kidwell, 1997; McCartan et al., 1995, and Pazzaglia, 1993) that were not evaluated by Crone (2000) or Wheeler (2005) or Wheeler (2006). UniStar geologists attended a three-day field trip affiliated with the Geological Society of America (Philadelphia, 2006) and lead by Dr. Frank Pazzaglia entitled: Rivers, glaciers, landscape evolution, and active tectonics of the central Appalachians, Pennsylvania and Maryland (Pazzaglia et al., 2006). The field trip was attended by a diverse group of geologists and geomorphologists. The trip afforded UniStar geologists the opportunity to engage with other regional experts on questions pertaining to the Quaternary and structural geology and tectonic framework of the Chesapeake Bay region (a portion of the field trip route is depicted in Figure 2.5-301).

(4) Previously mapped structures and tectonic-related geomorphology were evaluated utilizing aerial photography within a 5-mi-radius of the site and LiDAR data that encompassed St Mary's, Charles, and Calvert Counties, Maryland (a map depicting some of the LiDAR reviewed is provided in Figure 2.5-26). Multiple flights of fluvial terraces mapped previously by McCartan (1989a and 1989b) were evaluated where the Hillville and inferred Kidwell faults would project across fluvial surfaces of the Patuxent and Potomac Rivers. Lastly, aerial reconnaissance of many of the structures listed above was performed to assess their geomorphic expression and lateral continuity, if any (Figure 2.5-301).

For discussion purposes, ~~We divide~~ principal tectonic structures within the 200 mi (322 km) CCNPP site region were divided into five categories based on their age of formation or most recent reactivation. These categories include Late Proterozoic, Paleozoic, Mesozoic, Tertiary, and Quaternary. Late Proterozoic, Paleozoic, and Mesozoic structures are related to major plate tectonic events and generally are mapped regionally on the basis of geological and/or geophysical data. Late Proterozoic structures include normal faults active during post-Grenville orogeny rifting and formation of the Iapetan passive margin. Paleozoic structures include thrust and reverse faults active during Taconic, Acadian, Alleghanian ~~Allegheniah~~, and other contractional orogenic events. Mesozoic structures include normal faults active during break-up of Pangaea and formation of the Atlantic passive margin.

The following reference is added to Section 2.5.1.3

Pazzaglia, 2006. Rivers, glaciers, landscape evolution, and active tectonics of the central Appalachians, Pennsylvania and Maryland, *in* Pazzaglia, F.J., ed, Excursions in Geology and History: Field Trips in the Middle Atlantic States: Geological Society of America Field Guide 8. P. 169-197, F.J. Pazzaglia, D.D. Braun, M. Pavich, P. Bierman, N. Potter, D. Merritts, R. Walter, D. Germanoski, 2006.

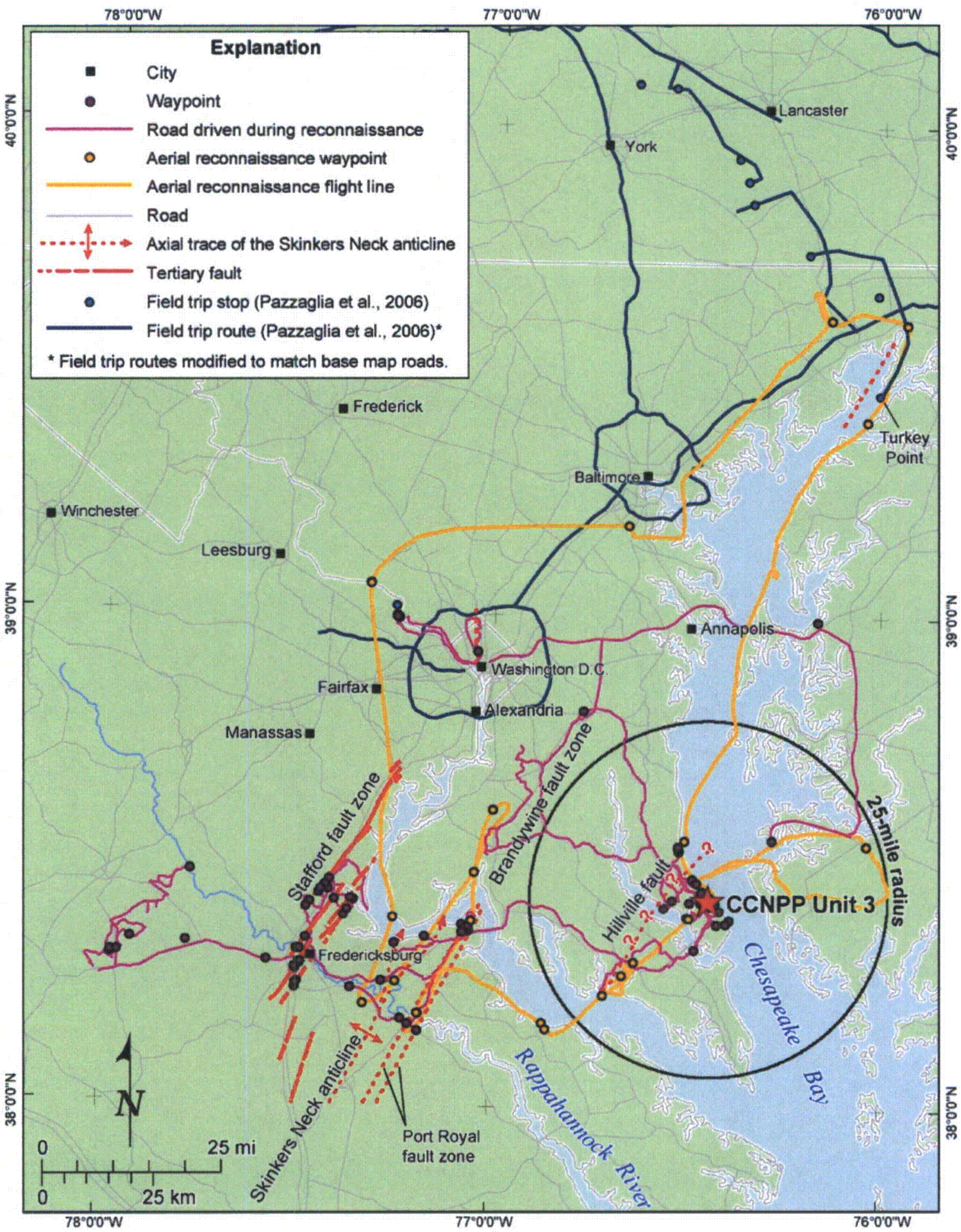
The first paragraph of Subsection 2.5.3.1 will be revised as follows:

2.5.3.1 Geological, Seismological, and Geophysical Investigations

The following investigations were performed to assess the potential for surface fault rupture at and within a 25 mi (40 km) radius of the CCNPP Unit 3 site (for a more complete description of the methodology see Subsection 2.5.1.1.4.4):

The following new Figure 2.5-301 is added:

Figure 2.5-301 {Field and Aerial Reconnaissance Map for CCNPP Unit 3}



RAI 219

Question 02.05.01-65

In FSAR Section 2.5.1.1.4.4.3, Mesozoic Tectonic Structures, you stated that there is no association of specific Mz basin bounding faults with demonstrable, associated seismicity or evidence of recent fault activity. In RAI 02.05.01-17 the NRC staff asked the applicant to provide a combined map of basins, boundary faults and depth coded epicenters to justify this assertion. The applicant provided a revised figure and stated that this illustrates that there is a low level of seismic activity within the 200 mile radius of CCNPP and the pattern of seismicity (earthquake magnitude, distribution and depth) is similar to the early EPRI distribution/catalog. No new large EQ associated with Mz basins are in the CCNPP region.

NRC staff notes that the revised figure shows epicenters clustered SE of traces of the Newark and Richmond basins northwestern boundary faults. In addition, the revised figure provided by you shows zero depths for nearly all the EQs, which precludes knowing if they occurred on the MZ faults or not. Zero km is not usually taken as a fixed depth for poorly located EQs. Please discuss the accuracy of the earthquake locations with respect to the basin and basin bounding faults and implications for recent interpretations of earthquakes below the basin in Precambrian rock.

Response

The input for response to RAI 71, Question 02.05.01-17 included a revised FSAR Figure 2.5-10. FSAR Figure 2.5-10 will be further revised in response to this question as discussed below. In the RAI 71 revision of FSAR Figure 2.5-10, a depth scale was added to the earthquakes from both the EPRI-SOG catalog and the updated catalog developed for the CCNPP Unit 3 COLA. In the updated catalog, there are 31 earthquakes within the extent of FSAR Figure 2.5-10, all of which have reported depths as shown in the figure. None of the post-EPRI earthquakes are located within the Richmond Basin, but four are located approximately 15 km east of the basin (Note: these earthquakes appear to plot on top of each other in FSAR Figure 2.5-10 due to the scale of the figure). None of the earthquakes from the updated catalog are located within the Newark basin, but 4 earthquakes are located either immediately east or west of the basin. For these earthquakes in the updated catalog, there are no formal epicentral location uncertainties reported within their parent catalog as reported by ANSS (see FSAR Subsection 2.5.2.1). However, location uncertainties for these events would have been assumed to be about 5 km under the original EPRI-SOG methodology.

In the EPRI-SOG seismicity catalog, there are 197 earthquakes within the extent of FSAR Figure 2.5-10 that have an Emb magnitude greater than or equal to 3.0. Of these earthquakes, 175 (89%) do not have reported depths. In the RAI 71 revised FSAR Figure 2.5-10, these earthquakes without depth information were plotted with a depth of 0 km. In the response to Question 02.05.01-65, FSAR Figure 2.5-10 will be revised to distinguish between zero depth earthquakes and earthquakes where no depth information is contained within the EPRI-SOG seismicity catalog. Of these 197 earthquakes, there are 13 located in or near the Richmond Basin and 19 earthquakes in or near the Newark Basin, none of which have depths within the EPRI-SOG catalog. Also, none of the earthquakes within the EPRI-SOG catalog have reported location uncertainties, but, based on the dates of their occurrence (1737 to 1980) and small size (five between Emb 4.0 and 5.1, the rest less than Emb 4.0), it is unlikely that any but the most recent would have been assigned an epicentral location uncertainly of less than 10 km and many of the oldest events with locations based on intensities estimates would have been assigned an epicentral uncertainly of 25 km or more.

Despite the lack of depth constraint on the earthquakes within the EPRI-SOG catalog and the absence of epicentral uncertainty estimates within both catalogs, recent work by Sykes et al. (2008) has suggested that seismicity occurring near the Ramapo Fault (the basin-bounding fault of the Newark Basin) occurs within Proterozoic to early Paleozoic rocks in the footwall of the fault and not along the fault. This work of Sykes et al. (2008) is discussed in detail in the response to RAI 134, Question 02.05.01-61 and FSAR Subsection 2.5.1.1.4.4.5.4, but in brief Sykes et al[2]. used well-located seismicity from a local network near the Ramapo Fault to demonstrate that: (1) there is not an alignment of seismicity with the southeast dipping Ramapo fault in cross section (FSAR Figures 2.5-216 and 2.5-217), and (2) seismicity located west of the Ramapo fault in map view is located within the Proterozoic to early Paleozoic footwall rocks (FSAR Figures 2.5-216 and 2.5-217).

Summarizing the content of this RAI response, the response to RAI 71, Question 02.05.01-17, and the material presented within FSAR Sections 2.5.1 and 2.5.2; seismicity within the attached FSAR Figure 2.5-10 does not suggest a need to modify the EPRI-SOG source model because:

- The spatial pattern of earthquakes in the updated seismicity catalog is consistent with the pattern observed in the EPRI-SOG catalog;
- There has been no new information or data developed since the EPRI-SOG study indicating that the EPRI-SOG teams' evaluations are not adequate representations of seismic hazard potential from these basins and faults; and
- Recent research supports the conclusion that seismicity adjacent to the bounding faults of the Mesozoic basins is not occurring along the faults (i.e. the Newark Basin; Sykes et al., 2008).

COLA Impact

Replace the existing FSAR Figure 2.5-10 with the updated figure attached.

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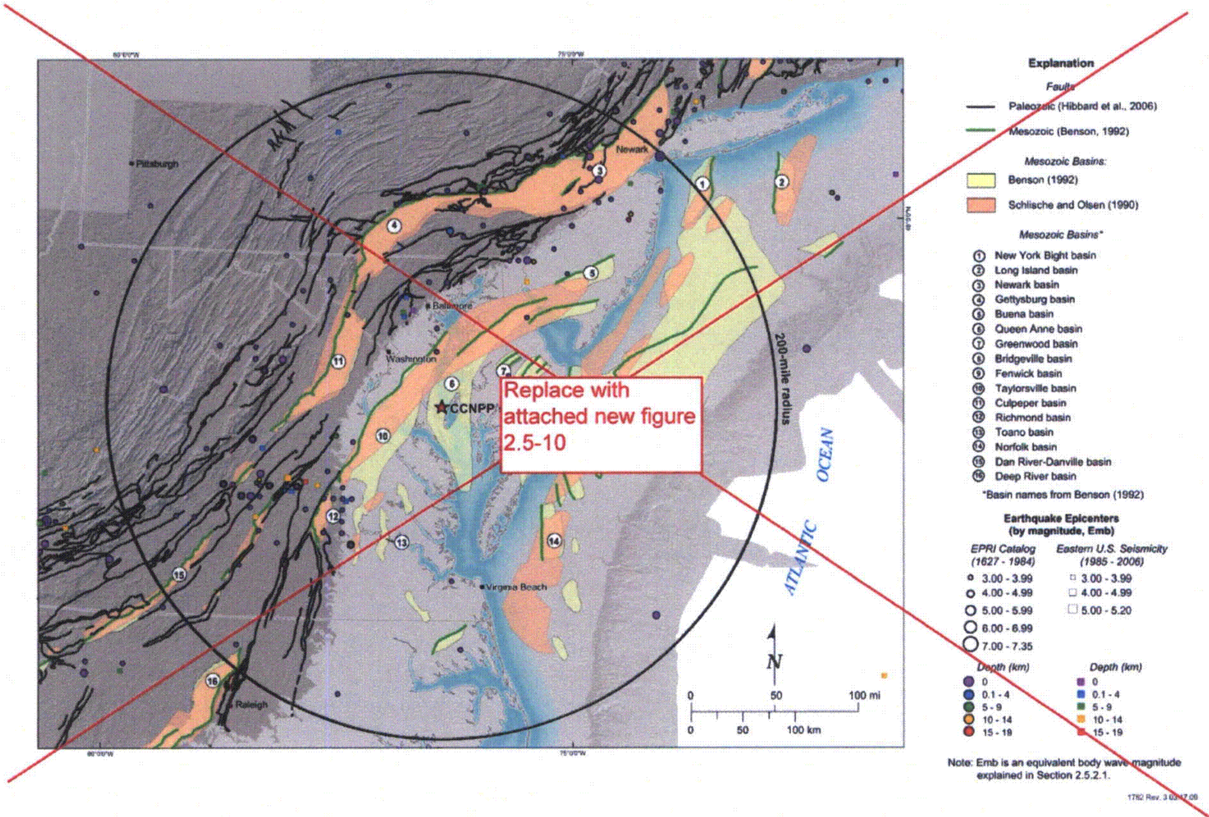
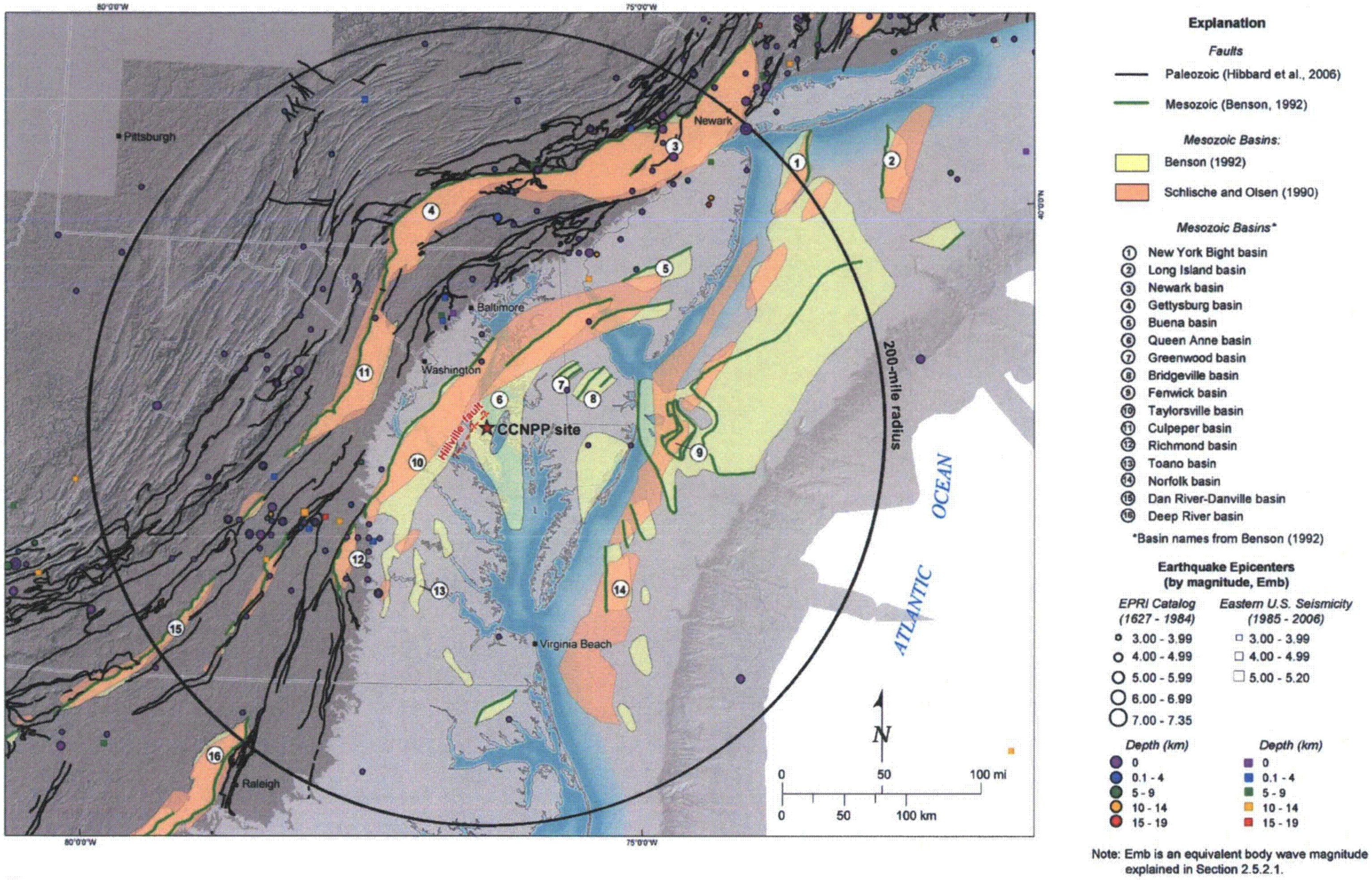
2 Sykes, L.R., Armbruster, J.G., Kim, W.-Y., and Seeber, L., 2008, Observations and Tectonic Setting of Historic and Instrumentally Located Earthquakes in the Greater New York City–Philadelphia Area: Bulletin of the Seismological Society of America, v. 98, p. 1696-1719.

Figure 2.5-10—{Map of Mesozoic Basins}





Replacement Figure 2.5-10

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