

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

NRC STAFF RESPONSE TO THE LICENSING BOARD'S
SECOND SET OF QUESTIONS ISSUED JANUARY 6, 2016 AND OTHER MATTERS

Pursuant to the Licensing Board's Memorandum and Order (Second Set of Board Questions and Associated Administrative Directives) of January 6, 2016 and the Initial Scheduling Order of November 16, 2015, the NRC staff (Staff) hereby responds to the Licensing Board's questions, which primarily address the Staff's final environmental impact statement. Consistent with these Board Orders, the Staff's written responses (or, as applicable, portions of responses) identify the responding subject matter expert(s) or individual(s) and are submitted in exhibit form, under oath, so that they are suitable for receipt into evidence without the personal appearance of each expert or individual.

The Staff has also identified a necessary correction in one of its responses to the Board's initial questions on the SER. In the NRC Staff Response to SER Question 25 (p. 15), final paragraph, fourth line, the word "northwest" should be replaced with the word "east." Dr. Henry Jones has provided an affidavit in Attachment B that affirms this correction. His statement of professional qualifications was previously provided.

The Staff's filing includes three attachments. Attachment A presents the Staff's responses to the Board's second set of questions. Attachment B presents the affidavits of Dr. Henry Jones (regarding the correction discussed above) and the Staff reviewers identified as authors of the responses to the Board's second set of questions. Attachment C presents the statements of professional qualifications of those Staff reviewers.

As the Board encouraged, the Staff and the Applicant coordinated development of their responses to minimize unnecessary repetition of information. Based on this coordination, the Staff is providing responses to all Board questions, and the Applicant is providing responses to some of the questions, as specified in its filing.

Respectfully submitted,

/Signed (electronically) by/

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Executed in Accord with 10 CFR 2.304(d)

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Dated at Jersey City, New Jersey
This 28th day of January, 2016

Attachment A

**NRC STAFF RESPONSES TO THE LICENSING BOARD'S
SECOND SET OF QUESTIONS ISSUED JANUARY 6, 2016**

**NRC Staff Responses To The Licensing Board's
Second Set Of Questions Issued January 6, 2016**

SER Section 2.5.1.2.1.4.2 Principal Tectonic Structures

SER Question 1: *On page 2-208 Staff summarizes the scheme used by Crone and Wheeler (2000) to classify the 17 potential Quaternary tectonic features that occur within the site region. Sixteen of these are "Class C Features," in which geologic evidence is insufficient to demonstrate the existence of a tectonic fault or Quaternary deformation associated with the feature. [a] What is the significance of the Crone and Wheeler classification for demonstrably active seismic zones? [b] Does a Class C designation imply that earthquakes in the Lancaster seismic zone could not pose a potential hazard to structures at the PSEG ESP site?*

NRC Staff Response to Question 1 (G. Stirewalt): The classification scheme presented in U.S. Geological Survey (USGS) Open-File Report 00-260 prepared by Crone and Wheeler (2000) is derived from a compilation of published geologic field data with the specific purpose of cataloging the existing geologic evidence for the presence of faulting, earthquake-induced liquefaction, and other possible surface-deforming tectonic features of Quaternary age in the Central and Eastern United States (CEUS). The primary goal of Crone and Wheeler (2000) was to provide a comprehensive database consisting of geologic information on known Quaternary tectonic features for consideration in assessing seismic hazard. The classification scheme of Crone and Wheeler (2000), which does not include historical seismicity data as part of the geologic database, defines Classes A, B, C, and D as follows:

Class A – Geologic evidence demonstrates the existence of a Quaternary fault of tectonic origin, whether exposed or inferred from liquefaction or other deformation features.

Class B – Geologic evidence demonstrates the existence of a fault or suggests Quaternary deformation, but either (1) the fault might not extend deeply enough to be a potential source of significant earthquakes or (2) the currently available geologic evidence is too strong to confidently assign the feature to Class C but not strong enough to assign it to Class A.

Class C – Geologic evidence is insufficient to demonstrate the existence of a tectonic fault or Quaternary slip or deformation associated with the feature.

Class D – Geologic evidence demonstrates that the feature is not a tectonic fault or feature.

[a] A demonstrably active seismic zone might or might not contain tectonic features that show Quaternary-age deformation. If the zone does not, then neither the zone itself nor any features within it would be designated as Class A. That is, this designation would not be appropriate because the focus of the classification scheme was to document the presence of faulting, earthquake-induced liquefaction, or other possible surface-deforming tectonic features of Quaternary age whether they were located inside or outside of an active seismic zone.

[b] The Class C designation for the Lancaster seismic zone specifically indicates that no geologic evidence exists in that zone for a known Quaternary-age tectonic deformation feature to which earthquakes in the zone can be related. The assignment of Class C does not imply that earthquakes in the Lancaster seismic zone could not pose a potential hazard to structures at the PSEG Site because the designation does not consider that historically significant earthquakes may have occurred in the surrounding area. The designation simply indicates there are no faults or other tectonic deformation features that can be considered as a specific potential earthquake source in the zone.

Earthquakes in the Lancaster seismic zone are specifically incorporated into the Applicant's seismic hazard assessment as part of the model described in NUREG-2115, "Central and Eastern United States Seismic Source Characterization for Nuclear Facilities" (CEUS-SSC). The CEUS-SSC model was published in 2012 and the model incorporated data from Crone and Wheeler (2000) into the database for the model. While the CEUS-SSC model does not specifically identify the Lancaster seismic zone as a separate distinct seismic source, the earthquake activity in the zone is incorporated into the regional model and used in the Applicant's seismic hazard analysis.

Reference: Crone, A. J. and Wheeler, R. L. 2000. "Data for Quaternary faults, liquefaction features, and possible tectonic features in the Central and Eastern United States, east of the Rocky Mountain front." USGS Open-File Report 00-260.

SER Question 2: *On page 2-210 Staff, citing the applicant, notes that the Cacoosing earthquake in the Lancaster Seismic Zone ". . . was anthropogenic (i.e., the result of human activities related to quarrying), rather than tectonic, in origin." Clarify what is meant by this statement; specifically, what role, if any, did tectonic stresses play in producing the destructive energy associated with this earthquake?*

NRC Staff Response to Question 2 (G. Stirewalt): The Staff reviewed the information published by Seeber and others (1998) related to the interpretation that the Cacoosing earthquakes had an anthropogenic origin. Seeber and others (1998) presented data indicating the Cacoosing earthquakes were spatially and temporally associated with activities at a rock quarry. Seeber and others (1998) state that removal of rock during decades of mining activities combined with ground water levels returning to their normal levels following the cessation of the mining and dewatering activities created a change in local stresses which likely caused the triggered earthquake sequence. Removal of large amounts of rock over many decades translated into negative load being created at the site and changed the local stress conditions. Following the closure of the mine and the cessation of dewatering process, ground water levels returned to their normal levels, effectively increasing the subsurface pore pressure in the carbonate rocks underlying the quarry area. These combined effects resulted in weaknesses in local joints and fractures resulting in triggering the Cacoosing earthquake sequence. The earthquake sequence, which began in May 1993 and continued into 1997, included a series of small earthquakes. The largest earthquake in the sequence occurred in January 1994 with a body-wave magnitude of 4.6.

The earthquake catalog used in the PSEG seismic hazard analysis, the NUREG-2115 earthquake catalogue, only includes natural earthquakes and does not incorporate man-made, or anthropogenic earthquakes. It is a standard process in probabilistic seismic hazard analyses (PSHA) that only natural earthquakes are incorporated into the seismic hazard calculations. Man-made or triggered earthquakes are excluded from PSHA studies, but they are evaluated as part of the overall geologic assessments of the site region. Therefore, as also noted by the Applicant, the Cacoosing earthquakes were not included in the NUREG-2115 catalogue and in the subsequent PSEG PSHA calculations. In summary, based on the scientific evidence provided in Seeber and others (1998) regional tectonic stresses did not cause the Cacoosing earthquake sequence. A localized stress change due to man-made activities is the primary reason for this earthquake sequence.

Reference: Seeber, L., J.G. Armbruster, W-Y Kim, and N. Barstow, 1998, "The 1994 Cacoosing Valley earthquakes near Reading, Pennsylvania: A shallow rupture triggered by quarry unloading". Journal of Geophysical Research, vol. 103, no. B10, pgs 24,505-24,521.

FEIS Question 3: *Explain the measures taken to verify the accuracy of PSEG's Environmental Report to the extent it has been relied on as a primary source for the NRC Staff's analysis.*

NRC Staff Response to Question 3 (J. Cushing, J. Saulsbury): The Staff used a range of measures to verify the accuracy of information provided in PSEG's Environmental Report (ER). These verification measures included:

- Conducting independent review of ER references to verify accuracy of information and data cited in the ER, and the appropriateness of data sources;
- Submitting RAIs to the Applicant and reviewing the responses from the Applicant;
- Conducting site audits at the PSEG Site (May 2012) and the alternative sites (April 2012) with the Applicant and Federal and State agencies;
- Consulting with Federal and State agencies;
- Using independent sources of information, such as the U.S. Census Bureau (USCB);
- Using the EPA's National Environmental Policy Act (NEPA) Assist tool, which compiles data from Federal agencies into a geographical information system tool;
- Comparing relevant information and data from the Final Supplemental EIS for license renewal of Salem Generating Station (SGS) and Hope Creek Generating Station (HCGS) (NUREG-1437, Supplement 45);
- Following applicable Staff guidance, including the Environmental Standard Review Plan (ESRP) (NUREG-1555), and ISG COL/ESP-ISG-026; and
- Using professional judgment about the reasonableness and conservatism of information, data, and assumptions cited in the ER. In exercising its professional judgment, the Staff was guided by the following two main considerations: (1) when the Staff estimated that impacts were minor and well below any applicable regulatory limits or standards, there was less of a need to reduce the uncertainty in the parameters used to estimate the impacts; and (2) the Staff's goal was to make sure that the impact estimates presented in the Final EIS (FEIS) would not underestimate the actual impacts that would occur during the various phases of the proposed action (i.e., building, operation, and decommissioning), while at the same time not being unreasonably conservative.

Specific examples for the selected resource areas include:

Land Use (M. Willingham, J. Saulsbury): The Staff toured the PSEG Site and the alternative sites and reviewed the New Jersey Department of Environmental Protection (NJDEP) land use and land cover data for the site and vicinity to verify the Applicant's use of the NJDEP data. Also, the Staff reviewed existing land use designations and requirements at both the State (e.g.,

County Preserved Farmlands under the State Farmland Preservation Program) and local (e.g., zoning requirements in Lower Alloways Creek Township and Elsinboro Township) levels to assess the compatibility of the proposed action with existing and proposed land use designations and requirements.

Water Use and Water Quality (M. Haque, D. Barnhurst, P. Meyer): The Staff confirmed the hydrologic characterization of the region and the site through review of on-site information provided by the Applicant, independent review of available data, and local and regional reports prepared by Federal, State, and regional, agencies. The Staff reviewed water use plans and requirements for permits. The Staff performed confirmatory analyses of the groundwater flow model presented by the Applicant to determine the impacts of dewatering. The Staff completed confirmatory analyses of the thermal impacts of plant discharges on the Delaware River and of the impacts of site groundwater pumping during operation on water quality in potentially affected aquifers. The Staff also performed an independent analysis of the impacts of groundwater pumping on off-site groundwater levels.

Aquatic Ecology (N. Kuntzleman, A. Miracle): The Staff verified information through site audits and discussions with various Federal and State agencies; Endangered Species Act and Essential Fish Habitat consultations with the National Marine Fisheries Service (NMFS); and data requests for rare species information from the NJDEP. The Staff also obtained information from peer-reviewed scientific literature, NMFS and U.S. Fish and Wildlife Service (FWS) technical reports, and the Internet websites of a variety of regulatory, conservation, and natural resources agencies and organizations such as the U.S. Army Corps of Engineers (USACE), Delaware River Basin Commission (DRBC), Partnership for the Delaware Estuary, NatureServe, NJDEP Division of Fish and Wildlife, DE Department of Natural Resources and Environmental Control, and Maryland Department of Natural Resources.

Socioeconomics and Environmental Justice (EJ) (D. Mussatti): The Staff used independent sources of information, such as the USCB, U.S. Department of Agriculture, and the U.S. Department of Labor, Bureau of Labor Statistics (BLS). While the Applicant may also have used those sources in the ER, the Staff went directly to those sources to verify or get updated data. The Staff also met with local government officials to verify and supplement information provided in the ER.

Historic and Cultural Resources (J. Davis, D. O'Rourke): The Staff performed an independent review of archaeological and architectural survey files maintained by the DE and the NJ State Historic Preservation Officers (SHPOs) to determine the presence and types of historic and cultural resources on and near the proposed project area. The Staff also collected information from the SHPOs on the historic and prehistoric context for the region. In addition, the Staff visited historic properties in the area and engaged with members of the public.

Radiological Health (D. Palmrose): The Staff compared the information in the ER to relevant information and data in the Site Safety Analysis Report and Design Control Document, and performed verification of proper application of applicable RGs, confirmatory calculations and code runs in accordance with accepted staff guidance, and consultation with relevant Staff safety reviewers.

FEIS section 2.2 Land Use

FEIS Question 4: *Staff states: “Section 2.2.1 describes land use on the site and in the vicinity, defined as the area encompassed within a 6-mi radius of the site.” Why is a 6-mile radius used? Is this a standard value or chosen specifically for this site?*

If it is a standard value, why is it appropriate for this site? If it is a value chosen specifically for this site, what was that choice based upon?

NRC Staff Response to Question 4 (M. Willingham, J. Saulsbury): The 6-mile radius is a standard value based on guidance provided in ESRP (NUREG-1555) Section 2.2.1, which defines “site” and “vicinity” as follows:

1. Site - That area of land owned or controlled by the Applicant for the principal purpose of constructing and operating a nuclear power station. As a general rule, the Applicant’s “site boundary” should be accepted as defining the site.
2. Vicinity - For small sites (on the order of 2 km²), the vicinity is the area encompassed within a radius of 10 km (6 mi). For larger irregularly shaped sites, the vicinity is a band or belt 10-km (6-mi) wide surrounding the plant site. The intent is to investigate land use in an area in which the site makes up no more than 10 percent of the area. If a lake or pond is to be created for use by the station, the entire water-body area should be included in the vicinity. The vicinity considered may follow natural or political boundaries.

Based on its review of the Applicant’s ER and responses to the Staff’s RAIs, the Staff determined that the 6-mile radius was representative of the land use resources that could potentially be affected by building and operating a nuclear power station at the proposed site. Additionally, the proposed PSEG Site represents less than 10 percent of the total land use area in the 6-mile radius vicinity. The Staff therefore believes that areas defined by the 6-mile radius provide a useful context for the assessment of potential land use impacts from building and operating a new nuclear power plant at the PSEG Site.

FEIS section 2.2.1 the Site and Vicinity

FEIS Question 5: *On page 2-10 Staff states, “Figure 2-6 depicts the jurisdictional wetlands (considered important terrestrial habitat) on the PSEG Site. The printed version of this figure may not be legible; however, the electronic version is viewable when zoomed in.”*

This is not correct. The electronic version is as illegible as the printed version. If practicable Staff shall provide a link to a more readable version.

NRC Staff Response to Question 5 (M. Willingham, N. Giffen, G. Zimmerman): The Staff intended to convey that the reference cited in the caption of Figure 2-6 on page 2-11 of the FEIS (USACE 2013-TN3283) contained the higher-quality electronic version. The full bibliographic citation for USACE 2013-TN3283 on page 11-72 in Chapter 11 of the FEIS contains the details the Staff intended to convey to the reader. The higher-quality version of FEIS Figure 2-6 (ADAMS Accession No. ML14085A112) can be accessed by the following link: <http://pbadupws.nrc.gov/docs/ML1408/ML14085A112.pdf>.

FEIS section 2.2.2.3 Proposed Access Road

FEIS Question 6: *On page 2-18 of the FEIS, Staff states: “PSEG has stated that additional access road capacity is necessary to address future transportation needs for the PSEG Site (PSEG 2015-TN4280). To provide this additional access road capacity, PSEG has designed a three-lane causeway that would be constructed on elevated structures for its entire length through the coastal wetlands.”*

Has there been an evaluation of whether improvements to the current access road could provide the additional capacity with fewer environmental impacts? If so, summarize that evaluation.

NRC Staff Response to Question 6 (J. Saulsbury, J. Cushing): The Applicant’s traffic impact analysis concluded that “separation of the existing operations and the construction workforces into two distinct paths (each to its own security checkpoint) is required, due to operational and security needs” (page 3 of Traffic Impact Analysis at the PSEG Site). Because of these stated security and operational needs, improvement to the existing access road is not a reasonable alternative to the causeway; therefore, the Staff and the USACE did not evaluate the environmental impacts of improvements to the existing access road in the EIS.

Reference: Traffic Impact Analysis at the PSEG Site Preliminary Findings Report. Prepared for PSEG Power, LLC, by KLD Engineering, P.C. Hauppauge, New York. TR-441, Rev. 5, July 15, 2013, ADAMS Accession No. ML13214A165.

FEIS Question 7: *On page 2-52, the Staff indicates that the water supply wells are monitored quarterly for chlorides. What would occur if future saltwater intrusion were discovered? Would PSEG’s state permit from NJDEP be subject to review or possible reduction?*

NRC Staff Response to Question 7 (D. Barnhurst, P. Meyer): Existing groundwater use by HCGS and SGS for industrial process and public non-community supply is permitted by NJDEP Water Allocation Permit No. WAP120001. This permit requires quarterly monitoring of chloride concentration in samples collected from five approved water diversion source wells and three observation wells. Samples from these wells obtain water from the Wenonah-Mount Laurel and Potomac Raritan-Magothy (PRM) aquifers. HCGS and SGS currently obtain water for plant uses solely from the PRM aquifer. Groundwater for a new plant would be obtained from the PRM aquifer using two new wells, and would require a revision of the existing water allocation permit. The Staff assumed for purposes of the EIS analysis that the chloride monitoring requirements of the revised permit would be similar to those of the existing permit.

An applicant for a permit to divert groundwater must provide all information that may establish that a proposed diversion will not cause an increase in saline intrusion that renders the water resource unfit for use (N.J.A.C. 7:19-2.2). The conditions of the water allocation permit are intended to ensure that the water quality of the water source is maintained and the water use standards are met (N.J.S.A. 58:1A-5). NJDEP uses the monitoring of aquifer chloride concentrations to ensure that the PRM aquifer water source utilized by HCGS and SGS continues to meet the groundwater quality standard for the designated potable use. If chloride concentrations were to increase such that the water standard for chloride in the aquifer were not met, NJDEP may recall the water allocation permit to determine if modification or revocation is necessary (N.J.A.C. 7:19-2.15). In the event the monitoring indicated that the chloride concentrations were increasing, the Applicant may also choose to modify the groundwater pumping to manage chloride concentrations. The Staff concluded in the FEIS that operational

pumping for a new nuclear power plant would increase chloride concentrations in the middle PRM aquifer, but these increases would be manageable, for example, by using the upper PRM aquifer as an alternative water source.

FEIS section 2.4.1.3 Important Terrestrial and Wetland Species and Habitats

FEIS Question 8: *On page 2-67, the Staff discusses the Bog Turtle. (See also page 5-24.) The Staff acknowledges that bog turtles were present on the site and within the vicinity between 1972 and 1978. Then the Staff indicates that they were not present between 2009 and 2010. What is the explanation for this loss of the species in this location? Is it due to PSEG's operations or to some other factor? (See page 4-33: "[I]ntense land uses such as those found on the PSEG Site are not favorable to [the Bog Turtle].") Additionally, will there be any attempt to monitor for this species during future construction?*

NRC Staff Response to Question 8 (M. Willingham, N. Giffen): Neither the Staff nor the Applicant has proposed any specific monitoring for the bog turtle or other terrestrial ecological resources. However, prior to the Applicant conducting any building activities on the site, the State of NJ may require the Applicant to monitor for the bog turtle, which has been designated as a state-listed endangered species and has some limited state-level protection under the NJ Endangered and Nongame Species Program. In correspondence dated March 20, 2013, the FWS concluded that building and operating new nuclear units at the PSEG Site would not likely affect the bog turtle (ADAMS Accession No. ML14070A595).

On page 2-68 of Section 2.4.1.3 of the FEIS, the Staff discusses threats to the bog turtle populations that have resulted in the decline of its abundance in the State of NJ. The primary threats include habitat loss due to development and natural succession, habitat fragmentation, and illegal collection. Ground disturbance caused by development are a potential sources of habitat loss and fragmentation and population declines of the bog turtle. Construction of SGS and HCGS began in 1968 and 1974 respectively, and it is possible that development of these facilities along with other land development activities within Salem County has played a past role in the localized destruction of habitat essential to the bog turtle. Additionally, the introduction of the invasive species of common reed (*Phragmites australis*) has likely contributed to the loss of habitat for the bog turtle.

As explained on page 4-33 of Section 4.3.1.2 of the FEIS, development of new facilities on the PSEG Site as it now exists is not expected to affect the bog turtle. As explained on page 5-24 of Section 5.3.1.2 of the FEIS, operations of a new plant would not be likely to impact the bog turtle.

FEIS section 2.4.1.3 Important Terrestrial and Wetland Species and Habitats

FEIS Question 9: *On page 2-78 and 79, a similar situation to the Bog Turtle exists with the Eastern Tiger Salamander. It once existed on the Artificial Island and is now absent. Is there an explanation for this finding in the most recent ecological survey? Additionally, will there be any attempt to monitor for this species during future construction?*

NRC Staff Response to Question 9 (M. Willingham, Giffen): As for the bog turtle, available evidence indicates that favorable habitat for the eastern tiger salamander no longer exists in areas potentially affected by the project, and neither the Staff nor the Applicant has proposed any specific monitoring for it. However, prior to the Applicant conducting any building activities on the site, the State of NJ may require the Applicant to monitor for the eastern tiger

salamander, which has been designated as a state-listed endangered species and has some limited state-level protection under the NJ Endangered and Nongame Species Program.

A description of the eastern tiger salamander is provided on pages 2-78 and 2-79 in Section 2.4.1.3 of the FEIS, as noted by the Board. The primary threats to this species, as discussed in that section, are attributed to losses of habitat and pond pollution (e.g., sedimentation). Land use changes as a result of ground disturbance are a potential source of habitat loss and population declines. Land disturbance to build SGS and HCGS began in 1968 and 1974 respectively, and it is possible that the development of these facilities along with other development activities within Salem County has played a role in the loss of habitat for this species. Additionally, the introduction of the invasive species of common reed (*Phragmites australis*) has likely contributed to loss and degradation of habitat.

As described on page 4-33 in Section 4.3.1.2 of the FEIS, the degraded habitat remaining on the PSEG Site does not appear to be conducive to supporting eastern tiger salamander populations. The Staff therefore does not expect the eastern tiger salamander to occur on the PSEG Site.

FEIS Question 10: *The draft EIS included in this table [Table 2-12] the Leatherback sea turtle and the Hawksbill sea turtle. The FEIS did not include these turtles. Staff shall explain their deletion from the table.*

NRC Staff Response to Question 10 (N. Kuntzleman, A. Miracle): The NMFS recommended that the hawksbill and leatherback sea turtles be deleted from draft EIS (DEIS) Table 2-8 in its November 12, 2014, letter providing comments on the DEIS (ADAMS Accession No. ML14332A089) since the Staff determined that neither hawksbill nor leatherback sea turtles occur near Artificial Island. Therefore, the Staff deleted the hawksbill and leatherback sea turtles from Table 2-8 (Section 2.4.1.3) and Table 2-12 (Section 2.4.2.3) in the FEIS.

FEIS Question 11: *This table [FEIS Table 2-21] lists unemployment rates from selected counties for several years. The most recent year shown is 2011. This was during an economic slump from which the economy has generally recovered, so the 2011 data might not be indicative of current conditions. Was consideration given to updating this table?*

NRC Staff Response to Question 11 (D. Mussatti): Yes, the Staff evaluated whether this table should be updated when developing the FEIS. For the DEIS, the most recent employment data were from the BLS's 2013 labor force and unemployment data sets (ADAMS Accession Nos. ML14094A019 and ML14094A355, respectively), but these data were actually from 2011 because there is a two-year lag between the data and their availability. The most current data available during the preparation of the FEIS for the PSEG ESP were from a BLS report published in 2014, which meant the data were from 2012— a year later than the data in the DEIS. When considering whether or not to update the data in Table 2-21, the Staff compared the values from the 2011 data against their analogous data points in 2012. In all cases, the largest change of the four counties in the table at question was less than one percent, and in all cases the unemployment rates were consistent with the magnitude of the unemployment rates for each county over the period between 2008 and 2011. Consequently, the Staff determined the differences were not significant (i.e., would not have affected the conclusions), and therefore did not warrant a revision in the FEIS.

Additionally, if a COL or CP application is later submitted, the Staff will prepare a supplement to the FEIS prepared for the PSEG ESP to consider whether there is new and significant

information relevant to the impacts of construction and operation of the facility. This approach ensures that the agency's decision regarding construction and operation of a facility will continue to be informed by the NEPA-required "hard look" at the environmental impacts of the proposed action. The Staff will perform its review in the supplemental EIS for the COL or CP, in accordance with NRC's regulations at 10 CFR 51.20(b)(1) and (2), 51.75(c)(1), and 51.92(b) and (e).

FEIS Question 12: *Staff shall confirm that the reference on page 2-159 to "the last age" should be to "the last ice age."*

NRC Staff Response to Question 12 (J. Davis, D. O'Rourke): The Staff confirms that the reference on page 2-159 of the FEIS is referring to the "the last ice age."

FEIS section 4.1.2 Offsite Areas

FEIS Question 13: *On pages 4-11 and 12, the Staff states that "building the proposed causeway would not be part of the NRC-authorized construction activities at the PSEG Site." (See also pages 4-83 and 84.) Staff shall confirm that the causeway is not a component of the NRC's NEPA review and that the extensive discussion of the causeway is largely a result of NRC's collaboration with USACE in preparing the FEIS.*

NRC Staff Response to Question 13 (J. Cushing, A. Kugler): Development of the causeway is not part of the NRC action because it is not an activity considered to be within the definition of "construction" in 10 CFR 51.4, but the causeway is part of the NRC's NEPA review as a cumulative impact. The Staff confirms that the extensive discussion of the causeway is largely a result of the collaboration with the USACE in preparing the FEIS because the causeway is part of their action in that it will impact jurisdictional wetlands within the USACE's regulatory authority.

FEIS Question 14: *On page 4-27 Staff notes that most of the wetland areas that would be impacted by future construction are near monocultures dominated by the invasive non-native common reed *Phragmites*. Could construction activities in *Phragmites*-dominated wetlands facilitate the spread of this species to nearby wetlands with more desirable plant communities? If so, will special procedures be followed to reduce the likelihood of this happening?*

NRC Staff Response to Question 14 (M. Willingham, N. Giffen): Although additional impacts resulting from the PSEG project could further promote conditions conducive to the growth of *Phragmites*, this invasive species is already prevalent throughout the wetlands in the vicinity of the site and ubiquitous to nearby coastal areas along the Delaware Bay. The Staff does not expect that ground disturbing activities associated with this project would cause any noticeable spread of *Phragmites* to nearby desirable plant communities. Therefore, any incremental contributions to the spread of this invasive species as a result of the PSEG project would likely be minimal. In addition, the Applicant has already conducted restoration activities in other areas of the Delaware Bay to restore native wetlands through its Estuary Enhancement Program. These activities are directed at reducing the area of *Phragmites* infestation in the region.

FEIS section 4.3.1.1 Terrestrial and Wetland Resources – Site and Vicinity

FEIS Question 15: *On page 4-27, the Staff indicates that close to 100 acres of wetlands would be temporarily disturbed during construction activities. Would these areas be recovered post-construction? If so, how?*

NRC Staff Response to Question 15 (M. Willingham, N. Giffen): The Applicant has expressed a willingness to consider restoration of temporarily disturbed wetlands as part of its future wetland mitigation program for the new facilities. Section 4.3.1.4, pages 4-40 through 4-43 of the FEIS discuss potential mitigation measures for permanent or temporary loss of terrestrial and wetland resources. Mitigation of unavoidable impacts to terrestrial and wetland resources may include restoration of habitats temporarily disturbed by development activities (e.g., construction laydown areas), creation of new habitat in previously disturbed areas, and enhancement of other natural habitat. Site-specific wetland mitigation methods might include control of *Phragmites*, restoration of hydrologic state, and wetland enhancement that includes restoration of desirable and native vegetation. The Applicant has indicated that any mitigation plans would be developed in consultation with the appropriate Federal, State, and local agencies. Additionally, PSEG-proposed mitigation would be situated both on the site and off the site, in the immediate vicinity to the extent practicable. Furthermore, the USACE will require a mitigation plan that could include wetland restoration as a condition of a Department of the Army (DA) permit for the unavoidable loss of wetlands at the PSEG Site.

FEIS section 4.3.1.1 Terrestrial and Wetland Resources – Site and Vicinity

FEIS Question 16: *On page 4-29, the Staff states that “[s]ome direct loss of less mobile species . . . would be expected.” This includes “small rodents, amphibians, and turtles.” Does this statement increase the need to explain the current absence of the Bog Turtle and Eastern Tiger Salamander from this location?*

NRC Staff Response to Question 16 (M. Willingham, N. Giffen): No further explanation is needed beyond the discussion on pages 4-33 and 4-34 of the FEIS indicating how the affected areas are not likely to support the subject species after the broad disturbance accompanying development of the existing facilities in the 1960s and 1970s. Although the bog turtle has been recorded historically at the PSEG Site prior to its initial development, the species was not recorded during the 2009 to 2010 survey conducted by the Applicant. Additionally, as noted on page 4-33 in Section 4.3.1.2 of the FEIS, the PSEG Site does not presently contain suitable habitat to support this species. Furthermore, as noted in the Biological Assessment in Appendix F of the FEIS, the FWS previously indicated that this species is not known to occur on or in the vicinity of the HCGS and SGS sites and that the proposed activity at the PSEG Site would not likely affect federally listed species. Therefore, the Staff determined that due to the absence of the bog turtle and suitable habitat at the PSEG Site, the proposed new facilities would have no impact on the bog turtle. In correspondence dated March 20, 2013, the FWS concluded that the building and operation of new nuclear units at the PSEG Site would not likely affect the bog turtle (ADAMS Accession No. ML14070A595).

Although the eastern tiger salamander has been recorded historically at the PSEG Site, the species was not recorded during the 2009 to 2010 survey conducted by the Applicant. Additionally, surveys of this species conducted in 1995 revealed that the eastern tiger salamander occurred at only a limited number of sites in Atlantic and Cumberland Counties. Section 4.3.1.2 page 4-33 of the FEIS notes that insufficient habitat exists on the PSEG Site to fulfill all life requirements of this species. Therefore, the Staff concluded that the proposed new facilities would not be expected to impact the eastern tiger salamander.

FEIS Question 17: *As referenced beginning on page 4-40, when will the USACE make a mitigation determination regarding this matter, particularly regarding wetlands resources?*

NRC Staff Response to Question 17 (A. Fetter): Although the NRC and the USACE were cooperating agencies throughout the EIS development process, the agencies' permitting timelines are different. The conclusions in the EIS regarding wetlands resources were based on the best available information.

Based on status communications with the USACE, the Staff understands that no DA permit will be issued to PSEG until a detailed plan of the mitigation work is developed demonstrating what will be performed at the mitigation site and how that plan will achieve the goal of mitigating the unavoidable impacts. For the more specific purposes of the USACE's permit determination, this plan has not yet been developed with sufficient detail to identify what measures would be conducted within the mitigation site and whether those mitigation efforts would be adequate to achieve the goals for functional improvements. As such, the USACE review of the DA permit application is ongoing.

FEIS Question 18: *Explain in more detail how "an approved wetland restoration and/or rehabilitation program" (page 4-41) might be instituted and enforced.*

NRC Staff Response to Question 18 (A. Fetter): As described in the Staff's response to FEIS Question 17, the NRC and USACE permitting processes are on different schedules. Based on status communications with the USACE, the Staff understands that once a detailed plan of the mitigation for the unavoidable loss of wetlands is developed and approved it would be included as a condition(s) of the DA permit. As a part of the DA approval process, a draft permit document would be forwarded to the Applicant describing all conditions to which the permit would be subject.

The Applicant has identified a potential compensatory wetland mitigation site to mitigate for the unavoidable loss of wetlands and waters associated with the work requiring a DA authorization. The site is referred to as the "Mason Point" site. This is an existing wetland complex that was diked and altered in conjunction with prior agricultural and land use practices. The concept of this wetland mitigation proposal would include a variety of dredging and filling activities along with the removal of old berms within this complex to restore historic functions and values to the system. The increase in wetland function would serve to compensate for the loss of functions and values resulting from the dredge and fill activities requiring DA authorization.

This mitigation work would also be reviewed by the State in conjunction with the Applicant's State authorizations. As the details of the mitigation work are developed, they will be coordinated by the State of NJ (NJDEP) and the USACE with EPA, FWS, NMFS, and the State resource agencies. Failure of an applicant to comply with any permit conditions could result in enforcement actions against the applicant/permittee with possible suspension and/or revocation of the DA authorization.

FEIS Question 19: *On page 4-42 Staff states "Wetland mitigation plan details would primarily be guided by conditions established under CWA Section 404 permits issued by the USACE or the NJDEP Land Use Regulation Program and Section 401 water-quality certifications issued by NJDEP. Therefore, specific wetland mitigation efforts could be determined as part of such authorizations (PSEG 2015-TN4280)." What role does the NRC have in ensuring that loss of wetland resources caused by future construction will be minimized and, if necessary, mitigated?*

NRC Staff Response to Question 19 (M. Willingham, N. Giffen): The USACE and NJDEP have regulatory authority over wetland mitigation under Section 404 and Section 401 of the

Clean Water Act as mentioned by the Board. An ESP does not authorize any NRC-regulated construction activities, and the NRC does not have the authority to regulate activities not defined as construction under 10 CFR 51.4. Therefore, the NRC has no role in ensuring that the loss of wetlands caused by activities regulated by the USACE or NJDEP will be minimized or mitigated. However, consistent with the NRC's NEPA process, as noted above in the response to FEIS Question 11, if a COL or CP application is later submitted, the Staff will prepare a supplement to the FEIS prepared for the PSEG ESP to consider whether there is new and significant information relevant to the impacts of construction and operation of the facility, including with respect to anticipated impacts to wetlands. This information would inform the NRC's licensing decision on the COL or CP. In addition, before the NRC can issue a COL or CP, it must verify that a Clean Water Act Section 401 certification has been issued by the NJDEP. Moreover, under 10 CFR 50.54(aa), a COL or CP would be subject to all conditions deemed imposed as a matter of law by [Clean Water Act sections] 401(a)(2) and 401(d).

FEIS section 4.3.1.4 Potential Mitigation Measures for Terrestrial Impacts

FEIS Question 20: *In the first paragraph of page 4-43, Staff states: "Mannington Meadow is a large enough area (3,800 ac) to provide good mitigation opportunities; however, much of it is in private, State, or Federal ownership (PSEG 2015-TN4280)."*

Is not virtually all property in either "private, State, or Federal ownership"? Is there meaning to this sentence that is not immediately obvious?

NRC Staff Response to Question 20 (M. Willingham, N. Giffen): The intent of the statement identified by the Board on page 4-43 of the FEIS is to acknowledge that Mannington Meadow is not under the ownership of a single entity, and as a result there are diverse entities with which PSEG would need to coordinate if Mannington Meadows were selected as a proposed wetlands restoration and/or rehabilitation site.

FEIS section 5.3.1.1 Terrestrial and Wetland Resources – Site and Vicinity

FEIS Question 21: *On page 5-8, the Staff indicates that third-party rights to Merrill Creek Reservoir can be obtained as required. What is the process to acquire these rights?*

NRC Staff Response to Question 21 (M. Haque): The Merrill Creek Reservoir (MCR) was incorporated into the DRBC Comprehensive Plan upon issuance of the Merrill Creek Reservoir Plan of Operation, Docket No. D-77-110 CP on October 24, 1984. The Plan of Operation has been amended seventeen times since then. The MCR is owned and operated by the Merrill Creek Owners Group (MCOG) to provide releases during DRBC-declared droughts in compensation for consumptive use of Delaware River Basin water in lieu of curtailing operations of the designated electric generating units. Release operations of the MCR are stipulated in DRBC Docket No. D-77-110 CP, as amended, as referenced in Section 5.2 of the FEIS (MCOG 2003-TN3312).

As indicated by PSEG, the Staff understands that at the time of application to NRC for a COL, PSEG would be able to negotiate with the other MCR co-owners to obtain additional storage for release from their existing rights. Modifications to the Plan of Operation and the list of designated units would be made with the approval of DRBC Executive Director.

FEIS Question 22: *On page 5-18 Staff states that dissolved solids in vapor plumes and drift from new LMDCT cooling towers have the potential to damage some plants. Modeling*

conducted by PSEG and confirmed by the Staff shows that maximum salt deposition rate is 1.31 kg/ha/mo, which is within the rate described by NUREG-1555 as generally not damaging to plants. On page 7-21 of Section 7.3.1.1 the Staff notes that other facilities, including HCGS, would have similar effects. What is the cumulative maximum salt deposition rate from all sources, including the proposed new PSEG facility, in the area downwind from the PSEG site shown on Figure 5-3? Is this value within the rate described by NUREG-1555 as generally not damaging to plants?

NRC Staff Response to Question 22 (M. Willingham, N. Giffen): The HCGS and proposed new cooling towers for the PSEG Site are the only facilities in proximity to each other that would contribute to a cumulative effect with respect to salt deposition. As discussed in FEIS Section 5.3.1.1 page 5-18, the maximum annual salt deposition rate from the new linear mechanical draft cooling tower (LMDCT) in any season would be 1.31 kg/ha/mo. Appendix B (*Environmental Protection Plan*) to *Facility Operating License No. NPF-57, Hope Creek Generating Station* (see NRC, 2011) provides the HCGS salt deposition rate as 113 mg/m²/mo (i.e., 1.13 kg/ha/mo), although the season is not specified. Also, Section 3.3.5.3 (Cooling Tower Salt Emissions) in the original EIS for the CP for HCGS (see AEC 1974) includes an estimate of the natural salt deposition rate from other sources (such as the Delaware River estuary) in the vicinity of HCGS, and an estimate of 130 kg/km²/mo (i.e., 1.3 kg/ha/mo) is provided.

The maximum salt deposition from new LMDCTs at the PSEG Site would occur at a distance of 700 m to the east, while that from the HCGS natural draft cooling tower (NDCT) would occur at a distance of 400 m to the southeast. Thus, because the salt deposition areas would not entirely overlap, the numerical values from the two cooling towers are not directly additive. However, the sum of the separate maximum rates from each cooling tower would bound the combined maximum for any given location. The sum yields 2.44 kg/ha/mo (1.31 from new LMDCTs + 1.13 from HCGS). When this value is added to the natural salt deposition in the area, a total of 3.74 kg/ha/mo (2.44 + 1.3) would result. Section 5.3.3.2 of ESRP (NUREG-1555) guidance states that deposition of salt drift (NaCl) at rates of 1 to 2 kg/ha/mo is generally not damaging to plants and deposition rates approaching or exceeding 10 kg/ha/mo in any month during the growing season could cause leaf damage in many species.

The numerical salt deposition rates, as discussed above, for a new nuclear plant at the PSEG Site (1.31 kg/ha/mo) and the cumulative maximum salt deposition rate from all sources (3.74 kg/ha/mo) is below the threshold of 10 kg/ha/mo that is recognized as causing damage to vegetation, but above the threshold of 2 kg/ha/mo that is generally not damaging to vegetation. However, considering that the analysis above is conservative in considering all salt deposition from all sources occurring in one location at one time, and that vegetation in the area has already adapted to naturally occurring levels of salt deposition, the Staff determined that cumulative impacts of salt deposition on the site and the vicinity would be minimal.

References: U.S. Atomic Energy Commission (AEC). 1974. *Final Environmental Statement Related to the Proposed Hope Creek Generating Station Units 1 and 2*, Docket Nos. 50-354 and 50-355, USAEC, Directorate of Licensing, Washington, D.C., February 1974. Section 5.1.1 pg 5-1 (available in NRC Public Document Room).

U.S. Nuclear Regulatory Commission (NRC). 2011. Appendix B (*Environmental Protection Plan*) to *Facility Operating License No. NPF-57, Hope Creek Generating Station, Docket No. 50-354*, Amendment 111, May 8, 1998. Document Dated July 20, 2011 (available as part of ADAMS Accession No. ML052720298).

FEIS Table 5-1. Maximum Predicted Salt Deposition Rate

FEIS Question 23: *On page 5-18, Table 5-1 shows the maximum salt deposition for a LMDC tower is in an easterly direction, but that maximum salt deposition for a natural draft cooling tower occurs in a northerly direction. Why does the type of tower used affect the direction of maximum salt deposition?*

NRC Staff Response to Question 23 (K. Quinlan, Y. Chang): Maximum salt deposition rates and locations depend on a combination of several factors. The primary factors include configuration and design of the cooling towers (e.g., orientation and characteristics of the emitted plume) and meteorological conditions (e.g., wind speed and direction, ambient temperature, relative humidity, atmospheric stability, and mixing height). In particular, lower ambient temperature and higher relative humidity are closely related to higher salt deposition, and lower wind speed and lower tower height result in higher salt deposition near the tower. The following discussion is based on 2006-2008 onsite meteorological data that was used in the Seasonal and Annual Cooling Tower Impact (SACTI) Prediction Code modeling for the FEIS. Generally, NDCT plumes tend to disperse the salt more evenly in all directions due to the circular nature of the cooling tower. In contrast, LMDCTs are aligned in a specific direction (e.g., east-west), so when the wind blows along the axis of the cooling tower, the salt drift is compounded along that axis and results in greater deposition downwind of the tower. Detailed information is included in the following paragraphs.

In general, the NDCT plumes tend to disperse the salt broadly due to the taller plume release height (the sum of physical tower height and buoyant plume rise caused by a greater volume of hot and humid effluents), which is quite different from LMDCTs. SACTI modeling results for two NDCTs indicated that directions of maximum salt depositions from the NDCTs vary by season: to the southeast in winter (due to lowest temperature and predominant wind direction); to the south in spring (due to lower temperature and frequent wind direction); to the north-northwest in summer (due to frequent wind direction and higher relative humidity); and to the north in fall (due to frequent wind direction and higher relative humidity). On an annual basis, the location of the maximum salt deposition rate is to the north of the NDCTs; however, salt deposition rates in the southeast, south-southeast, south, and north-northwest directions are comparable, but slightly less than the rates north of the cooling towers.

The two modeled LMDCTs each have a tower length, width, and height of 817 ft, 100 ft, and 46 ft, respectively. Each LMDCT has 34 cells with a cell diameter of 31.6 ft, the axes of which are oriented in the east-west direction. For this configuration of cooling towers, westerly or easterly wind direction becomes a dominating factor for maximum salt deposition rates due to its cumulative nature. In other words, winds from the west or from the east could cumulatively add salt deposition resulting from each cell into the cells in the downwind direction. SACTI modeling indicated that the salt deposition rate is highest to the east of the LMDCTs and secondarily to the west of the LMDCTs throughout the year. In contrast, salt deposition rates in other directions are much smaller than those from west or east wind directions. Higher salt deposition rate to the east than to the west of the towers is due to the predominant wind direction (from the west). These salt deposition distributions are depicted in FEIS Figure 5-3, "LMDCT Salt Deposition Rates."

FEIS Question 24: *Table 5-2 on page 5-20 shows that ambient noise at night is typically similar to ambient noise during the day. The two exceptions to this are locations 3 (open area adjacent to high-use onsite road) and 6 (open area near Delaware River shoreline). In these two*

areas, nighttime noise levels are higher than daytime noise levels. Are these higher nighttime noise levels due to human activities or are they from natural sources?

NRC Staff Response to Question 24 (M. Willingham, N. Giffen): The noise levels shown in FEIS Table 5-2 were obtained by PSEG during on-site monitoring in February 2009 at the seven locations identified in the table. Potential sources of noise according to Section 2.5.5 of the PSEG ER (Revision 4) include:

“Day and night measurements were taken at each location. Sources of environmental sounds noted during the observations at the PSEG Site included the HCGS cooling tower, vehicle traffic, overhead transmission lines, transformers, heating, ventilating, and air conditioning units, and aircraft in the area. PSEG security operates a small arms firing range on-site. The firing range was not active during the monitoring periods.”

And, also:

“. . . ambient noise samples indicate higher noise levels at two locations, near the cooling tower (location 5) and the high-use on-site road (location 3). However, the higher noise levels recorded at location 3 reflect the effects of activities associated with an operating work force shift change during the pre-dawn hours.”

The reason for the higher nighttime noise levels at location 6 (open area near the Delaware River shoreline) is not discussed in the PSEG ER. However, the Staff notes that nighttime noise levels similar to, if not identical to, those at location 6 also exist at location 2 (open area near the meteorological tower), location 4 (open area under the 500 kV transmission line), and location 7 (open area near material services building, HCGS intake pumphouse and Delaware River shoreline), all of which are in open areas.

As discussed on page 4-29 in Section 4.3.1.1 and page 5-20 in Section 5.3.1.1 of the FEIS, it is anticipated that general noise levels from building and operation of new nuclear units at the PSEG Site would dissipate to ambient levels within a short distance, which is below that which would normally cause a response in wildlife.

FEIS Question 25: *On page 5-38, the Staff asserts that cold shock is less likely to occur at a multi-unit plant. Are there other favorable environmental consequences (apart from positive economic impacts) that are likely to occur from construction of an additional reactor or reactors on Artificial Island?*

NRC Staff Response to Question 25 (N. Kuntzleman, A. Miracle, D. Mussatti, A. Kugler): Aside from the positive economic benefits identified in the FEIS, there are no other favorable environmental consequences that are likely to occur from construction of an additional reactor or reactors on Artificial Island. However, building one or more reactors would both meet the need for power, as discussed in Chapter 8 of the FEIS, and avoid the need to build fossil-fueled power plants, with their attendant greenhouse gas emissions, as discussed in Section 9.2.5 of the FEIS.

FEIS section 5.12 Measures and Controls to Limit Adverse Impacts During Operation

FEIS Question 26: *On the bottom of page 5-118 one example of “measures to minimize impacts and protect the environment” is given as “using BMPs for construction and*

preconstruction activities.” Are using “BMPs for construction and preconstruction activities” expected to limit adverse impacts during operation?

NRC Staff Response to Question 26 (J. Cushing): No, using BMPs for construction and preconstruction activities would not limit adverse impacts during operations. The statement should have read, "using BMPs for operational activities".

FEIS Section 6.2.1 Transportation of Unirradiated Fuel

FEIS Question 27: *This section calculates radiological and nonradiological impacts of transporting new fuel under normal and accident conditions. The shipping of new fuel is shown to be so innocuous that one might reasonably question the value of the effort put into these calculations. For future environmental impact assessments, can this evaluation be performed in a generic manner?*

NRC Staff Response to Question 27 (D. Palmrose, S. Maheras): Yes, such a generic analysis already exists and is codified in Table S-4 of 10 CFR 51.52. However, in the case of PSEG, the fuel type indicated in the PSEG ESP application does not meet all of the conditions in paragraph (a) of 10 CFR 51.52 and, therefore, a detailed analysis of the environmental effects of transportation of fuel and wastes to and from the reactor was required. As discussed in various locations in FEIS Section 6.2, the Staff applied a generic analysis from WASH-1238 to compare to the detailed transportation of radioactive material impact analysis, whether for new (or unirradiated) fuel, spent fuel, or radioactive waste. The results for this generic analysis are a key part of the results shown in FEIS Tables 6-3, 6-5, and 6-6. The Staff compared the site-specific analysis results for the impacts from the transportation of new fuel, dependent on the transportation route from a nuclear fuel fabrication plant to the sites (proposed and alternatives) and on the number of expected normalized average annual shipments for each reactor design being considered by the Applicant, to the WASH-1238 reference light water reactor (LWR) values to reach an environmental finding. It should be noted that the reference LWR results in WASH-1238 for shipping new fuel are based on transporting the new fuel a distance of 3200 km, while the shipping distances for new fuel based on actual facilities in the PSEG FEIS were about 4400 km, exceeding the generic distance. For these reasons, the Staff needed to perform a site-specific evaluation.

Reference: WASH-1238, *Environmental Survey of Transportation of Radioactive Materials To and From Nuclear Power Plants* (ADAMS Accession No. ML14092A626)

FEIS Question 28: *On page 6-25, concerning new fuel radiation levels, Staff states: “Assuming conservatively that the external dose rate at 2 m (6.6 ft) is at the maximum allowed by regulations (10 mrem/hr), the dose rate at 1 m (3.3 ft) is about 14 mrem/hour (Weiner et al. 2008-TN302).”*

This indicates that at 1 meter the dose rate is greater than the dose rate at 2 meters by a factor of 1.4. On page 6-26, also concerning new fuel radiation levels, the Staff states:

This scenario addresses potential traffic interruptions that could lead to a person being exposed to a loaded shipment for 1 hour at a distance of 4 ft. The NRC staff’s analysis assumed this exposure scenario would occur only one time to any individual, and the dose rate was at the regulatory limit of 10 mrem/hour at 2 m (6.6 ft) from the shipment. The dose to the MEI was calculated in DOE (2002-TN1236) to be 16 mrem.

This indicates that at 1.22 meters (4 ft) the dose rate is greater than the dose rate at 2 meters by a factor of 1.6. These two statements are inconsistent. The dose rate should increase monotonically as the fuel is approached. So one of the Staff statements appears incorrect. Staff shall resolve this discrepancy.

NRC Staff Response to Question 28 (D. Palmrose, S. Maheras): The two dose rates referenced in the question are different because the analysis used as the reference sources applied different computer codes (i.e., RADTRAN 5 and RISKIND), with different assumptions. While both codes are used to model doses for the transport of radioactive materials, RADTRAN 5 was generally used to estimate the radiological doses to populations and transportation workers, such as inspectors, during routine operations, whereas RISKIND was generally used to estimate radiological doses to potentially maximally exposed individuals (e.g., individuals stuck in traffic) and to the population during routine transportation. In both analyses, the dose rates are conservatively assumed to be at the regulatory maximum dose rate (10 mrem/hr) and in the first analysis, a single individual is assumed to be exposed to all shipments, so it is unlikely that actual impacts would be higher. Regardless of which computer code is used, the dose rates would increase monotonically as the package is approached by an individual as the Board noted in the question. Using RISKIND, for example, the dose rate at 1.2 m from the edge of the transport vehicle is 16 mrem/hr, and the corresponding monotonically increasing dose rate at 1 m is 18 mrem/hr.

FEIS Question 29: *On page 7-24, the Bog Turtle and Eastern Tiger Salamander are referenced in conjunction with transmission line construction. What is the specific “cumulative” impact on these two species as a result of Salem, Hope Creek, a new reactor plant, the proposed causeway, traffic strikes (see page 5-22), and new transmission lines? Although referenced generally on page 7-24, what are the specific proposed BMPs, mitigation proposals, and avoidance strategies that would reduce the cumulative impacts on these two species?*

NRC Staff Response to Question 29 (M. Willingham, N. Giffen): As stated on page 4-33 in Section 4.3.1.2 of the FEIS, the PSEG Site does not presently contain suitable habitat for the Federally threatened bog turtle or the NJ State-listed endangered eastern tiger salamander. These species were not found in recent surveys and would not be expected to occur on the PSEG Site. Therefore the Staff does not expect that continued operations of SGS and HCGS or the potential new nuclear units and associated infrastructure would add additional cumulative effects on these species.

Page 7-24, Section 7.3.1.2 of the FEIS, makes general reference to potential BMPs, mitigation, and avoidance as factors in determining the extent of potential impacts to the bog turtle and eastern tiger salamander. The Staff does not know the specific measures to be taken by each of the projects listed in Table 7-1 on pages 7-2 through 7-6 of the FEIS. However, the Staff expects that these projects would use similar techniques as described in the FEIS in Section 4.3.1.4 on pages 4-40 and 4-41. These techniques could include avoiding wetland habitats, minimizing impacts to wetlands, restoration of disturbed habitats, or creation of new habitat. Both species favor wetland habitats that are protected under Federal and the State of NJ regulations, and the Staff therefore expects that the USACE and NJDEP would ensure that permits for development in such wetland areas are protective of both species.

FEIS section 7.3.1.2 Cumulative Impacts to Important Terrestrial and Wetland Species and Habitats

FEIS Question 30: *This section evaluates the cumulative effects of past and present projects upon environmental justice issues. Since the need to perform a cumulative impact assessment derives from NEPA while the need to assess environmental justice does not, why is this section needed? Did the Staff develop insights into environmental justice issues through this evaluation that it could not have developed through other means?*

NRC Staff Response to Question 30 (D. Mussatti): The Commission decided to consider EJ issues as a part of its NEPA review process, as outlined in its “Policy Statement on the Treatment of Environmental Justice Matters in NRC Regulatory and Licensing Actions” (ADAMS Accession No. ML032550485). Therefore, the NRC approach to considering EJ impacts, including consideration of cumulative EJ impacts, conforms to the way that the Staff considers other environmental impacts through its NEPA process. Based on the Commission’s approach to EJ assessments, the Staff gained additional insights into EJ issues by assessing the cumulative EJ impacts from the proposed project.

The Staff has two guidance documents through which insights into EJ issues can be evaluated. The methodology used by the Staff to perform its EJ analyses is found in Office Instruction LIC-203, Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues (ADAMS Accession No. ML12234A708), and the ESRP (NUREG-1555). Based on the Commission’s instruction, the Staff developed the guidance documents listed above consistent with the methodology established by the President’s Council on Environmental Quality (CEQ), “Environmental Justice, Guidance Under the National Environmental Policy Act” (ADAMS Accession No. ML13022A298). These NRC and CEQ guidance documents provide for considering cumulative impacts in an EJ analysis.

FEIS Question 31: *The evaluation of the need for power—as well as numerous other evaluations throughout the FEIS—are all based upon a new plant that becomes operational in 2021. As a practical matter, there appears very little chance of this occurring. If an application for a COL or CP is eventually submitted, will all the evaluations based upon an operational date of 2021 be updated? If not, which evaluations will not be updated and why is this acceptable?*

NRC Staff Response to Question 31 (D. Mussatti): If a COL or CP application is submitted, the Staff will prepare a supplement to the FEIS prepared for the PSEG ESP to consider any new and significant information related to the construction and operation of the facility, including with respect to the need for power. This approach ensures that the agency’s decision regarding building and operation of a facility will continue to be informed by the NEPA-required “hard look” at the environmental impacts of the proposed action. The Staff will perform its review in the supplemental EIS for the COL or CP, in accordance with NRC’s regulations at 10 CFR 51.20(b)(1), 51.75(c)(1), and 51.92(b) and (e).

FEIS Table 9-24. Comparison of Cumulative Impacts at the Proposed PSEG Site and Four Alternative Sites

FEIS Question 32: *This table compares alternative sites for construction of a new nuclear power plant. This comparison is based upon the cumulative impacts of building and operating a new plant plus the impacts of all other projects, past and present, that have affected the local environment. It seems this comparison has results based more upon what prior projects have done to the environment and less on what effect the current project would have on the*

environment. (Consider section 7.0 that evaluates cumulative impacts of building and operating a plant at the PSEG site in conjunction with all other past, present and foreseeable future actions. The impacts of NRC related activities are essentially negligible contributors to the cumulative impacts.) Also, it biases the decision in the direction to construct the plant at the location having the most virgin, pristine and pure environment (because cumulative effects there would be less).

Why then are cumulative impacts a better basis for comparison of alternate sites than the impacts of the project itself?

NRC Staff Response to Question 32 (A. Kugler, J. Cushing, G. Zimmerman): The consideration of cumulative impacts in the comparison of alternatives is consistent with guidance in the CEQ's June 24, 2005, memorandum to all Federal agencies (ADAMS Accession No. ML12088A268). However, the Staff recognized the potential that the consideration of cumulative impacts could skew the comparison, and took this into consideration in its guidance, ISG COL/ESP-ISG-026. In order to avoid biasing the decision to build the plant at the location having the most virgin, pristine and pure environment, the Staff uses both cumulative impacts and the impacts of the project itself (i.e., incremental impacts) to compare alternative sites with the proposed site. The approach directed by the guidance ensures that the siting recommendation appropriately considers the contribution of the project to the cumulative impacts at each site.

Throughout the FEIS the Staff has been careful to document and discuss both the incremental impacts and the cumulative impacts of building and operating a new nuclear power reactor, as well as to draw a distinction between these types of impacts. For example, in the alternative site comparison in FEIS Table 9-24, the Staff lists the cumulative impacts at the proposed site and the alternative sites. Then in FEIS Section 9.3.6.2, the Staff discusses how it used the information in FEIS Table 9-24 to compare the incremental and cumulative impacts among and between sites. In each of the discussions on whether the alternative site is environmentally preferable to the proposed site, the Staff discusses the contribution of the project to the cumulative impacts at both the proposed and alternative site. Note that a similar discussion of the incremental impacts of a new nuclear power plant at the PSEG Site is presented for the resource categories included in the list of cumulative impacts in FEIS Table 7-4. Based on the incremental impacts of the project and whether the project was a significant contributor to the cumulative impacts, the Staff determined if the alternative site was environmentally preferable to the proposed site.

Reference: ISG COL/ESP-ISG-026, Attachment 6: Staff Guidance for Alternatives Reviews for New Reactor Environmental Impact Statements, Appendix 2, Regarding the Consideration of Cumulative Impacts for the Alternative Sites (ADAMS Accession No. ML14100A471).

FEIS section 10.2.1 Unavoidable Adverse Impacts during Construction and Preconstruction

FEIS Question 33: *Some of the "actions to mitigate impacts" listed in Table 10-1 are required by law, and some are not. Has Applicant committed to implement some or all of the latter? If some, which? How will compliance be monitored and enforced?*

Update status of the "ongoing" consultation between USACE and the New Jersey State Historic Preservation Office, described on page 10-11.

NRC Staff Response to Question 33 (J. Cushing, J. Davis, A. Fetter, A. Kugler): Although an ESP does not provide NRC authorization to conduct construction activities, the Staff and the USACE evaluated the impacts of building and operating a plant at the PSEG Site under NEPA. Because the Applicant will not be conducting NRC authorized activities under an ESP, there are no necessary mitigation measures for NRC regulated activities at this stage. The Applicant would, however, be subject to permitting conditions from other State, local, and Federal agencies based on applicable requirements associated with certain project activities (e.g., issues related to wetlands mitigation, land-use and construction management, and species conservation). With the exception of the mitigation activities associated with the PSEG traffic study, all of the activities listed in Table 10-1 in the FEIS are associated with expected permit requirements of other Federal, State, and local agencies. The Staff evaluated the reasonably foreseeable mitigation activities discussed in Table 10-1 in the FEIS for the purposes of NEPA in the FEIS. Appropriate Federal, State, and local permitting agencies would be responsible for monitoring compliance and enforcement of activities that are not related to the NRC's jurisdiction of radiological health and safety and common defense and security.

With respect to the PSEG traffic study in Table 10-1 in the FEIS, the recommendations are not requirements of another permitting agency. These measures could be implemented as a result of local zoning process, which is outside of the NRC's regulatory authority.

If issued, the USACE Department of Army (DA) permit for filling wetlands and dredging activities would contain as permit conditions mitigation measures such as seasonal restrictions for dredge and fill activities to mitigate impacts to fisheries and other wildlife resources during spawning or nesting seasons. Any failure to comply with any conditions in the DA permit would be subject to enforcement actions by the USACE.

As a Federal agency, the USACE has an obligation to comply with Section 106 of the National Historic Preservation Act. However, the USACE has previously developed regulations identified at Appendix C under 33 CFR 320 et. seq. to implement those responsibilities. Pursuant to Appendix C, the USACE utilizes the term "permit area" to identify the areas subject to USACE compliance responsibilities under Section 106. Three separate permit areas have been identified by the USACE. These areas include: (1) the dredge and fill areas at the new reactor plant site; (2) the proposed causeway area between the plant site and Money Island Road; and (3) the proposed wetland mitigation site. To date, no adverse impacts to historic or cultural resources have been identified within permit areas (1) or (2). The permit area for the wetland mitigation site (3) has not been formally identified as yet. This permit area cannot be formally identified until a detailed mitigation plan is developed that would clearly identify any proposed/required earth work activities to facilitate the wetland mitigation work. Once the detailed wetland mitigation plan is developed, the permit area for this work will be identified by the USACE at which time a determination would be made in conjunction with the NJ SHPO, Tribes, and interested members of the public as to whether there are any historic or cultural resources within the permit area and whether there would be any impacts to those resources. These determinations and any necessary mitigation would be completed prior to finalization of any DA permit. Should any agreement be required as a result of this consultation, it would be included in the DA permit as a special condition.

FEIS section 10.2.2 Unavoidable Adverse Impacts during Operation

FEIS Question 34: *Some of the “actions to mitigate impacts” listed in Table 10-2 are required by law, and some are not. Has Applicant committed to implement some or all of the latter? If some, which? How will compliance be monitored and enforced?*

Update status of USACE’s consultation with Native American tribes, described on page 10-15.

NRC Staff Response to Question 34 (J. Cushing, J. Davis, A. Fetter, A. Kugler): As stated in response to FEIS Question 33, although an ESP does not provide NRC authorization to conduct construction activities, the Staff and the USACE evaluated the impacts of building and operating a plant at the PSEG Site under NEPA. Because the Applicant will not be conducting NRC authorized activities under an ESP, there are no necessary mitigation measures for NRC regulated activities at this stage.

With the exception of the mitigation activities associated with staggering departure and arrival times and outage schedules to minimize impacts to transportation routes, all of the activities listed in FEIS Table 10-2 are associated with expected permit requirements of other Federal, State, and local agencies. The response to FEIS Question 33 also provides detailed information related to the USACE’s permitting processes, which includes development of specific mitigation prior to issuance of a DA permit.

As discussed in response to Question 33, the USACE’s Tribal consultation will be completed prior to the issuance of any DA permit for this activity.

Attachment B

**AFFIDAVITS FOR NRC STAFF RESPONSES TO SECOND SET OF QUESTIONS ISSUED
JANUARY 6, 2016 AND CORRECTION TO INITIAL STAFF RESPONSE TO QUESTION 25**

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

AFFIDAVIT OF HENRY JONES

I, Henry Jones, do hereby declare as follows:

1. I am a Hydrologist in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the correction to NRC Staff Response to Initial SER Question 25 submitted as a part of "NRC Staff Response to the Licensing Board's Initial Questions Issued on December 15, 2015." This correction is addressed in the cover pleading to this filing.
3. I attest to the accuracy of this correction statement, support it as my own, and endorse its introduction into the record for this proceeding. I declare under penalty of perjury that the correction of the Staff's response and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Henry Jones

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

AFFIDAVIT OF ALLEN FETTER

I, Allen Fetter, do hereby declare as follows:

1. I am a Senior Project Manager in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of New Reactor Licensing. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Allen Fetter

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

AFFIDAVIT OF GERRY STIREWALT

I, Gerry Stirewalt, do hereby declare as follows:

1. I am a Senior Geologist in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Gerry Stirewalt

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

AFFIDAVIT OF JACK CUSHING

I, Jack Cushing, do hereby declare as follows:

1. I am a Senior Project Manager in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Jack Cushing

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

AFFIDAVIT OF JAMES SAULSBURY

I, James Saulsbury, do hereby declare as follows:

1. I am a Senior Research and Development Staff member in Oak Ridge National Laboratory's Transportation Planning and Decision Science Group, Energy and Transportation Science Division. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

James Saulsbury

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF MICHAEL WILLINGHAM

I, Michael Willingham, do hereby declare as follows:

1. I am a Project Manager in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Michael Willingham

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

AFFIDAVIT OF MOHAMMAD HAQUE

I, Mohammad Haque, do hereby declare as follows:

1. I am a Senior Hydrologist in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Mohammad Haque

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 27, 2016

AFFIDAVIT OF DANIEL BARNHURST

I, Daniel Barnhurst, do hereby declare as follows:

1. I am a Hydrologist in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Daniel Barnhurst

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

AFFIDAVIT OF PHILIP MEYER

I, Philip Meyer, do hereby declare as follows:

1. I am a Senior Research Engineer in the Pacific Northwest National Laboratory's Energy and Environment Directorate, Hydrology Group. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Philip Meyer

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF ANNE "NANCY" KUNTZLEMAN

I, Nancy Kuntzleman, do hereby declare as follows:

1. I am an Aquatic Biologist in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Nancy Kuntzleman

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF ANN MIRACLE

I, Ann Miracle, do hereby declare as follows:

1. I am a Senior Scientist in the Pacific Northwest National Laboratory's Energy and Environment Directorate, Earth Systems Science Division. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Ann Miracle

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF DANIEL MUSSATTI

I, Daniel Mussatti, do hereby declare as follows:

1. I am an Economist in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Daniel Mussatti

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF JENNIFER DAVIS

I, Jennifer Davis, do hereby declare as follows:

1. I am a Senior Project Manager in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Jennifer Davis

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF DANIEL O'ROURKE

I, Daniel O'Rourke, do hereby declare as follows:

1. I am Principal Cultural Resource Specialist in the Argonne National Laboratory's Environmental Science Division, Natural and Sociocultural Systems Department. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Daniel O'Rourke

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF DONALD PALMROSE

I, Donald Palmrose, do hereby declare as follows:

1. I am a Senior Reactor Engineer in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Donald Palmrose

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF NEIL GIFFEN

I, Neil Giffen, do hereby declare as follows:

1. I am a Natural Resources Manager in the Oak Ridge National Laboratory's Facilities and Operations Directorate. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Neil Giffen

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF ANDREW KUGLER

I, Andrew Kugler, do hereby declare as follows:

1. I am a Senior Environmental Project Manager in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Andrew Kugler

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF KEVIN QUINLAN

I, Kevin Quinlan, do hereby declare as follows:

1. I am a Physical Scientist in the Nuclear Regulatory Commission's (NRC) Office of New Reactors, Division of Site Safety & Environmental Analysis. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Kevin Quinlan

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 27, 2016

AFFIDAVIT OF YOUNG-SOO CHANG

I, Young-Soo Chang, do hereby declare as follows:

1. I am an Environmental Systems Engineer in the Argonne National Laboratory's Environmental Science Division, Atmospheric Science and Climate Research Program. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Young-Soo Chang

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF STEVEN MAHERAS

I, Steven Maheras, do hereby declare as follows:

1. I am a Senior Scientist in the Pacific Northwest National Laboratory's Energy and Environment Directorate, Nuclear Sciences Division. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)
Steven Maheras

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
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NUCLEAR, LLC)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application))	January 28, 2016

AFFIDAVIT OF GREGORY ZIMMERMAN

I, Gregory Zimmerman, do hereby declare as follows:

1. I am a Research and Development Manager and Leader in the Oak Ridge National Laboratory's Environmental Sciences Division, Human Health Risk & Environmental Analysis Group. A statement of my professional qualifications is attached.
2. I am responsible for the statements in the responses to Board questions (or portions of questions) in Attachment A "NRC Staff Response to the Licensing Board's Second Set of Questions Issued January 6, 2016" for which I am listed as an author.
3. I attest to the accuracy of those statements, support them as my own, and endorse their introduction into the record for this proceeding. I declare under penalty of perjury that my statements in the foregoing responses to Board questions and my statement of professional qualifications are true and correct to the best of my knowledge and belief.

Executed in Accord with 10 CFR § 2.304(d)

Gregory Zimmerman

Attachment C

**NRC STAFF STATEMENTS OF PROFESSIONAL QUALIFICATIONS FOR RESPONSES TO
LICENSING BOARD'S SECOND SET OF QUESTIONS ISSUED JANUARY 6, 2016**

Allen H. Fetter, Ph.D.
Statement of Professional Qualifications

Current Position

Senior Project Manager
Environmental Projects Branch
Division of New Reactor Licensing
Office of New Reactors
U.S. Nuclear Regulatory Commission

Education

Ph.D., Geology, University of Kansas, Lawrence, Kansas
M.S., Geology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina
B.A, Geology, Guilford College, Greensboro, North Carolina

Professional

U.S. Nuclear Regulatory Commission Senior Project Manager
Geological Society of America, Member

Qualifications

Dr. Fetter is the U.S. Nuclear Regulatory Commission (NRC) environmental Project Manager (PM) for review of the PSEG Site Early Site Permit (ESP) application, and has about 7 years of experience as a project manager within the NRC Office of New Reactors (NRO). Since the docketing of the PSEG Site ESP application, he has planned and coordinated most aspects of the NRC staff's environmental review of the application, including the acceptance review and docketing, scoping and information gathering, site audits, and preparation of the draft and final environmental impact statements (EISs). Dr. Fetter also planned and executed public meetings for comment on the draft EIS, and interfaced effectively with other government entities and stakeholders throughout the environmental review process. In addition to the PSEG ESP application review, he has worked at NRC a total of over 11 years as a qualified technical reviewer and project manager on a variety of pre-application activities and licensing reviews pertaining to high-level waste storage and disposal, in-situ uranium recovery, complex materials sites, and other new reactor siting applications. Most of Dr. Fetter's work as a project manager at the NRC has involved coordinating and managing a number of environmental reviews, and the associated preparation of environmental assessments and environmental impact statements as part of the NRC licensing process and the agency's implementation of NEPA.

Prior to coming to NRC, Dr. Fetter spent several years in the private sector where he worked as a hydrogeologist and project manager on numerous geotechnical, geophysical and hydrological site characterizations to determine the suitability of sites for waste disposal and to assist in the development of remediation plans for contaminated industrial sites. He also spent time in academia where he utilized heavy and rare-earth isotopes to delineate the crustal framework and reconstruct the tectonic evolution of complex metamorphic Precambrian geologic domains in North and South America, Africa and Antarctica. He was invited to Universidade Estadual Paulista in São Paulo, Brazil and spent 5 years helping to design, equip and manage two state-of-the-art isotope geochemistry labs for preparation of geologic and environmental samples for analysis by mass spectroscopy, and to expand and continue his research in South America. He obtained external funding for field research and laboratory equipment, and established a revenue source through the analytical work performed in the laboratory. He taught short courses on isotope chemistry and laboratory techniques, and their application to studies of environmental monitoring, and geologic and

tectonic evolution. Dr. Fetter also advised undergraduates and graduate students with their research projects and served as a committee member for seven graduate student oral examinations and final defense examinations. He refereed journal articles for the *Journal of South American Earth Sciences* and *Gondwana Research* and evaluated the merits of research proposals for CNPq (Brazilian equivalent to NSF). While in Brazil, he developed collaborative research projects with fellow scientists in Brazil (USP –São Paulo, UNICAMP, UFC, UF-Brasília), and in the United States (UNC – Chapel Hill, University of Kansas), publishing the results in peer-reviewed journals. Dr. Fetter is the author and coauthor on 22 publications related to geology.

Gerry L. Stirewalt, Ph.D., P.G., C.E.G.
Statement of Professional Qualifications

CURRENT POSITION

Senior Geologist
Geoscience and Geotechnical Engineering Branch 2 (RGS2)
Division of Site Safety and Environmental Analysis (DSEA)
Office of New Reactors (NRO)
U.S. Nuclear Regulatory Commission (NRC)
Rockville, MD

EDUCATION

Postdoctoral Research Studies
 Structural Geology and High-Temperature Experimental Deformation, University of British Columbia, Vancouver, British Columbia, Canada, 1971-1973
 Structural Geology and Petrofabrics, Lemont-Doherty Geological Observatory of Columbia University, Palisades, NY, 1969-1971
Ph.D. in Structural Geology from the University of North Carolina at Chapel Hill, Chapel Hill, NC, 1970
B.A. in Geology and Mathematics from Catawba College, Salisbury, NC, 1964

PROFESSIONAL

U.S. NRC Qualified Technical Reviewer for New Reactor Applications
Professional Organization Memberships
 Geological Society of America (GSA) and the following Divisions of GSA:
 Structural Geology and Tectonics
 Environmental and Engineering Geology
 Geology and Society
 History and Philosophy of Geology
 American Geophysical Union
 Association of Engineering and Environmental Geologists
Professional Registrations
 Registered Professional Geologist and Certified Engineering Geologist (Number 229 and E229) in Oregon
 Registered Professional Geologist (Number 896) in North Carolina

EXPERIENCE

Dr. Stirewalt is a structural geologist with more than 43 years of national and international experience in geoscience, including university teaching, independent consulting, and working as a contractor on site characterization of nuclear and other critical power facilities. His experience as a contractor encompassed work with an architectural engineering firm on projects in Southeast Asia and the U.S; with the Department of Energy in the high level radioactive waste (HLW) disposal program (including interface with the Canadian and Swedish site characterization programs, overview of the characterization of all potential sites for the first HLW repository, and development of the second repository program in crystalline rock locations east of the Mississippi River); with the NRC for 3D geospatial modeling of Yucca Mountain and other

non-HLW facilities; and with the NRC on Yucca Mountain at the Center for Nuclear Waste Regulatory Analyses. His primary technical specialty lies in field geologic site characterization for critical facilities. His particular interests include investigation of tectonic deformation features (faults, shear zones, and fractures) and paleoseismic features in relation to potential for surface deformation and geologic and seismic hazard, and assessment of geologic data for seismic source characterization.

Dr. Stirewalt's 43 years of experience include working as a geologist at the NRC for the past 10 years, initially with the HLW program in NMSS but also in NRO preparing Safety Evaluation Reports for COL and ESP applications (e.g., Vogtle, Summer, Levy, Lee, PSEG); participating in mandatory licensing hearings for Vogtle and Summer and a contested hearing for Levy under 10 CFR Part 52; reviewing application materials in ESP or COL applications for Calvert Cliffs, Comanche Peak, and Harris as the primary technical reviewer of Sections 2.5.1 and 2.5.3; acting as a member of the Technical Integration Team for characterization of seismic sources in the central and eastern U.S. as presented in NUREG-2115; re-assessing seismic hazard at operating nuclear power plants as required by the 50.54(f) letters that were issued following the NTTF Fukushima recommendations; interfacing with external stakeholders, including applicants and licensees, in various public and non-public meetings; and mentoring junior staff.

Dr. Stirewalt is the author or co-author of more than 56 technical publications related to the field of geoscience.

Jack Cushing
Statement of Professional Qualifications

CURRENT POSITION

Senior Project Manager
Environmental and Technical Support Branch
Division of Site Safety and Environmental Analysis
Office of New Reactors

EDUCATION

B.S. Marine Engineering, Massachusetts Maritime Academy

PROFESSIONAL

Advisory Council on Historic Preservation: The Section 106 Essentials,
National Preservation Institute: Cultural and Natural Resources: An Integrated Management
Strategy

National Preservation Institute: Native American Graves Protection and Repatriation Act
(NAGPRA) and the Archaeological Resources Protection Act (ARPA): Applications and
Requirements

QUALIFICATIONS

Mr. Cushing has 33 years of environmental, licensing, and operating experience in the nuclear power field. The 33 years includes, 17 years of regulatory experience with the NRC, and 16 years of operating experience as both an auxiliary operator and a licensed reactor operator at Maine Yankee nuclear power plant. Since joining the NRC, Mr. Cushing has been a project manager for operating reactors and an environmental project manager for license renewal applications and for new reactors. Specifically, he managed the environmental reviews for Farley Nuclear Plant and Fort Calhoun Station license renewal and for the North Anna early site permit. Mr. Cushing has, in addition to PSEG early site permit application, supported a number of new reactor combined license applications reviews including Summer, Fermi, South Texas Project, Calvert Cliffs, Bell Bend, and Turkey Point. This professional experience required the coordinating the licensing reviews for new and operating nuclear facilities as well as providing technical oversight for the historic and cultural resource review for the PSEG early site permit project.

Mr. Cushing, has been responsible for coordinating the development of several environmental guidance documents, including COL/ESP-ISG-026, Interim Staff Guidance on Environmental Issues Associated with New Reactors and COL/ESP-ISG-027, Interim Staff Guidance on Specific Environmental Guidance for Light Water Small Modular Reactor and the NRC

endorsement of NEI 10-07 NEI 10-07, Industry Guideline for Effective Interactions With Agencies Other Than NRC During the Early Site Permit Process.

Prior to joining the Office of New Reactors, Mr. Cushing served as a Senior Project Manager in the Office of Nuclear Reactor Regulation, Division of License Renewal. In that position, he was the environmental project manager for two license renewals and the North Anna early site permit review. As the project manager for those reviews he was responsible for coordinating the National Historic Preservation Act Section 106 reviews with the States and Tribes.

James “Bo” Saulsbury
Statement of Professional Qualifications

CURRENT POSITION

Senior R&D Staff
Transportation Planning and Decision Science Group
Energy and Transportation Science Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

EDUCATION

M.S., Planning, The University of Tennessee, 1989
B.A., History, The University of Tennessee, 1986

QUALIFICATIONS

Mr. Saulsbury has over 28 years of experience at Oak Ridge National Laboratory (ORNL) conducting research and managing National Environmental Policy Act (NEPA) projects to identify and assess the environmental impacts of technology and policy. He began his career at ORNL in 1987 as a University of Tennessee Graduate Student Researcher working on a NEPA project for the Air Force to assess the environmental impacts of low-altitude military training flights. Mr. Saulsbury became a full-time staff member at ORNL in 1990, and has since worked on a wide variety of NEPA projects to assess the impacts of nuclear power plant licensing, license renewal, and in-situ leach uranium mining (Nuclear Regulatory Commission); hydroelectric, coal, and geothermal power plant and biorefinery construction and operation (Department of Energy and Federal Energy Regulatory Commission); the disposal of chemical weapons stockpiles (U.S. Army); and the United States Antarctic research program (National Science Foundation).

Mr. Saulsbury has contributed to four separate NEPA projects for the Nuclear Regulatory Commission since the mid-1990s. He served as a socioeconomic and land use Subject Matter Expert (SME) for the *Generic Environmental Impact Statement for License Renewal of Nuclear Plants* (NUREG-1437) published in May 1996. He served as ORNL Project Leader and socioeconomic and land use SME for the *Environmental Impact Statement to Construct and Operate the Crownpoint Uranium Solution Mining Project, Crownpoint, New Mexico* (NUREG-1508) published in February 1997. Mr. Saulsbury served as socioeconomic and environmental justice SME for the *Environmental Impact Statement for Combined Licenses (COLs) at the Comanche Peak Nuclear Power Plant Site Units 3 and 4* (NUREG-1943) published in May 2011. Most recently, he served as ORNL Project Leader and land use SME for the *Final Environmental Impact Statement for an Early Site Permit (ESP) at the PSEG Site* (NUREG-2168) published in November 2015.

Mr. Saulsbury has also served as ORNL Project Leader on several large NEPA projects for other Federal agencies, including the Federal Energy Regulatory Commission (*Environmental Impact Statement: Eight Proposed Hydroelectric Projects In The Skagit River Basin, Washington* published in April 1998 and *Environmental Impact Statement: Missouri-Madison Hydroelectric Project, Montana* published in September 1999) and the Department of Energy (*Environmental Impact Statement: Orlando Gasification Project, Orlando, Florida* published January 2007). He has also co-authored two journal articles on NEPA practice: "Including Past and Present Impacts in Cumulative Impact Assessments" (with L.N. McCold, *Environmental Management*, Vol. 20, No. 5, pp. 767-776, September 1996) and "Defining the No-Action

Alternative for National Environmental Policy Act Analyses of Continuing Actions” (with L.N. McCold, *Environmental Impact Assessment Review*, Vol. 18, pp. 15-37, January 1998).

In addition to conducting and managing NEPA assessments, since 2000 Mr. Saulsbury has worked to provide consumers with information about vehicle fuel economy through the ORNL Fuel Economy Information (FEI) Project, which is responsible for the Department of Energy’s annual *Fuel Economy Guide* and website www.fueleconomy.gov. Mr. Saulsbury has managed the ORNL FEI Project for DOE since 2013.

Michael H. Willingham
Statement of Professional Qualifications

Current Position

Project Manager
Hydrology and Meteorology Branch 2
Division of Site Safety and Environmental Analysis
Office of New Reactors
U.S. Nuclear Regulatory Commission (NRC), Washington, D.C.

Education

M.S. Environmental Engineering and Science, Johns Hopkins University, Baltimore, Maryland
B.S. Environmental Science, Texas A&M University Corpus Christi, Corpus Christi, Texas

Professional

Duke University Environmental Leadership Courses: Implementation of the National Environmental Policy Act (NEPA); Accounting for Cumulative Effects under NEPA; Considering Greenhouse Gas Emissions and Climate Change under NEPA; Preparing and Documenting Environmental Impact Analyses; Socioeconomic Impact Analysis under Implementation of NEPA; and Scoping, Public Involvement, and Environmental Justice.

Aquaveo: Hydrologic and Hydraulic Modeling with WMS

Project Manager Qualification, NRC

Sigma Xi, The Scientific Research Society, Associate Member

Qualifications

Mr. Willingham is a Project Manager with over nine years of experience managing and participating in multidisciplinary environmental and safety related projects for the NRC. His experience includes NEPA reviews, preparation of environmental impact statements (EISs), and pre-application activities associated with environmental reviews of new reactors. Additionally, he supported safety assessments related to Near-Term Task Force Recommendation 2.1 and 2.3 flood hazard reviews.

As a Project Manager in the hydrology and meteorology branch 2 (RHMB2) at the NRC, Mr. Willingham is responsible for planning, coordinating, and developing staff assessments related to NTF Recommendation 2.3 and 2.1 flood hazard reviews under Title 10 of the *U.S. Code of Federal Regulations* (10 CFR) Part 50.54(f). He continues to serve as a technical manager and hydrology reviewer in support of the Japan Lessons-Learned Division for numerous operating reactors staff assessments. Mr. Willingham provides technical support and completes staff assessments of Flooding Walkdown Report Supporting Implementation of Near-Term Task Force Recommendation 2.3 and Recommendation 2.1.

Prior to joining RHMB2, Mr. Willingham served both as an environmental project manager and technical reviewer for the Environmental Technical Support Branch (RENV) and the Environmental Projects Branch 1 (RAP1). He planned, coordinated, and developed environmental impact statements for: Vogtle Electric Generating Station, Units 3 and 4 combined license (COL); Comanche Peak Nuclear Power Plant, Units 3 and 4 COL; and Turkey

Point, Units 6 and 7 COL. Mr. Willingham was the environmental lead for the environmental review and environmental impact statement development of the Comanche Peak Nuclear Power Plant, Units 3 and 4 COL application. He supported the terrestrial ecology and hydrology reviews of Vogtle Electric Generating Station COL and Turkey Point COL. He has coordinated communication and consultations with Federal and State agencies in support of those activities. Mr. Willingham was essential in the development of new reactors' environmental review pre-application process and served as a technical reviewer for terrestrial ecology, hydrology, and land-use in support of those activities.

Prior to joining the NRC, Mr. Willingham was employed with the Texas Commission on Environmental Quality as an Environmental Investigator and Emergency Response Coordinator for the Waco Regional Office from 2004 to 2006. He was responsible for performing complex technical work in the field of wastewater and stormwater management in the Waco Regional Office. Activities included conducting technical inspections, sanitary surveys, and follow-up investigations, preparing technical reports documenting field activities and observed conditions; conducting environmental monitoring; collecting and analyzing environmental samples; and providing technical assistance to the public and regulated community.

As a graduate and undergraduate (2001-2004), he researched the environmental effects of naturally occurring radioactive material from abandoned uranium mines in south Texas for the Texas A&M University's Division of Nearshore Research.

Mohammad Haque
Statement of Professional Qualifications

CURRENT POSITION

Senior Hydrologist
Environmental Technical Support Branch
Division of Site Safety and Environmental Analysis
Office of New Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C.

EDUCATION

M.S., Civil Engineering, University of Texas at Arlington, Texas
B.S., Civil Engineering

PROFESSIONAL

Registered Professional Engineer (P.E.), Virginia, Maryland, and Massachusetts
Member Tau Beta Pi (National Engineering Honor Association)
Member of Chi Epsilon (National Civil Engineering Honor Fraternity)

QUALIFICATIONS

Mr. Haque is a Civil Engineer with over 40 years of experience in environmental and water resources engineering with private and public sectors, including about eighteen years at the U.S. Nuclear Regulatory Commission (NRC). His experience at the NRC includes about seven years in the Division of Site Safety and Environmental Analysis, initially serving as a project manager and then as a technical expert reviewing hydrologic aspects of safety analysis reports and environmental reports for various early site permit (ESP) and combined license (COL) applications in the Office of New Reactors; and about eleven years serving as a project manager for various uranium recovery facilities in the Division of Waste Management (DWM), and for fuel manufacturing facilities in the Division of Fuel Cycle Safety and Safeguards (FCSS) in the Office of Nuclear Material Safety and Safeguards (NMSS). At the NRC, besides managing projects, Mr. Haque has prepared various environmental assessments and technical evaluation reports, and served as the lead in performing surface water hydrologic modeling.

Prior to joining NRC, Mr. Haque served as Chief of Engineering Plan Review Division at Prince William County, Virginia for about four years. At the County, his responsibilities included administration of floodplain management, and watershed management programs. He served on various Northern Virginia engineering committees on regulatory aspects and design standards. He served as the Chairman of Prince William County Design and Construction Standards Committee.

While at graduate school, Mr. Haque also taught courses on hydrology and water quality and pollution control. After graduation, he began his career in private sector working with consulting engineering companies in Houston, Texas.

Daniel Barnhurst
Statement of Professional Qualifications

Current Position

Hydrologist
Office of New Reactors (NRO)
US Nuclear Regulatory Commission (NRC)

Education

2003 M.S., Geology, Brigham Young University
2000 B.S., Geology, Brigham Young University

Professional

Professional Geologist

Experience

U.S. Nuclear Regulatory Commission, Rockville, MD

May 2008 to Present, Hydrologist

Responsibilities include:

- NEPA EIS Development for hydrology portions of new reactor applications.
- Review and analysis of groundwater and surface water models.
- Hydrological analysis of potential impact at proposed facilities. Technical review areas include characterization, modeling and analysis of surface and ground area including; flow, contaminant fate and transport, water use and quality impacts.
- Safety and environmental technical reviews, participation in technical site audits with new reactor applicant, participation in legal licensing hearings.
- Developing and maintaining professional relationships with other Federal agencies and industry.
- Review and development of guidance documents for NRC staff and industry.

Washington Savannah River Co., Aiken, SC

October 2003 to May 2008, Geologist

Responsibilities included:

- Plan and perform characterization of geology, hydrology and contamination at RCRA/CERCLA waste units per applicable regulations.
- Responsible for geologic analysis and creation of various geologic maps (i.e., structure, cross-section and isopach maps) using core and geophysical data.
- Groundwater flow and contaminant fate and transport modeling to support remedy selection, monitoring well network optimization and characterization planning for nuclear RCRA/CERCLA waste units.
- Plan and perform groundwater and surface water sampling including measurement of head, stage and flow as well as creation of water budgets, potentiometric surface maps, cross-sections and conceptual models to detail groundwater/surface water interaction.
- Responsible for detailed written and oral presentation of results to project team, state and federal regulatory agencies (USEPA, SCDHEC), and Department of Energy client.
- Project planning and development of field work and monitoring documents (Work Scope, Sample and Analysis Plan, Monitoring Plans etc.).
- Technical Oversight subcontractors and field activities including soil, groundwater and surface water sampling, well drilling and installation, and related activities (coring, logging, development, abandonment).

Philip D. Meyer
Statement of Professional Qualifications

CURRENT POSITION

Senior Research Engineer
Hydrology Group, Energy and Environment Directorate
Pacific Northwest National Laboratory
Richland, Washington

EDUCATION

Ph.D., University of Illinois, Civil Engineering, 1992
M.S., University of Illinois, Civil Engineering, 1988
B.A., Cornell University, Physics, 1986

PROFESSIONAL

American Geophysical Union, Member
ANS-2.17 Working Group Member, Revised ANSI/ANS-2.17-2010, Evaluation of Subsurface Radionuclide Transport at Commercial Nuclear Power Plants

QUALIFICATIONS

Dr. Meyer is a Sr. Research Engineer at Pacific Northwest National Laboratory with more than 20 years of experience in applying hydrologic principles to the solutions of engineering problems, with a focus on modeling flow and transport through unsaturated and saturated porous media, and consideration of the effects of uncertainty on the model results and engineering solutions. Dr. Meyer has evaluated and/or applied multiple analytical and numerical hydrologic models, parameter estimation methods, and probability modeling and statistical methods. Dr. Meyer has experience with the analysis of flow and transport in soil covers, engineered barriers, and the near-field environment at waste disposal facilities, which included data collection and analysis for the near-field environment of the U.S. Dept. of Energy Hanford Site Integrated Disposal Facility performance assessment. As part of research sponsored by the NRC, Dr. Meyer developed a methodology to estimate the combined impact of uncertainties in hydrogeologic model parameters, conceptualization, and future scenarios. The practicality and benefits of this methodology were demonstrated in applications to geostatistical modeling of subsurface properties, uranium transport in groundwater, and groundwater flow at a new reactor site. Dr. Meyer's experience includes the development, evaluation, and application of simulation models and optimization methods to the design of groundwater monitoring networks, and the evaluation of uncertainty in modeling the stimulated bioreduction of uranium.

Dr. Meyer's support to the Nuclear Regulatory Commission includes preparation of ten NUREG/CR reports and a number of related peer-reviewed journal articles addressing modeling, parameter estimation, and uncertainty assessment in low-level radioactive waste disposal, dose assessment for decommissioning, and new reactor licensing. Dr. Meyer has supported the NRC Office of New Reactors since 2007. He was the principal author and technical analyst for the groundwater sections of safety evaluations for the North Anna Unit 3 COL, Calvert Cliffs Unit 3 COL, and Vogtle Units 3 & 4 COL. In addition, he was a contributor to the North Anna Unit 3 and Vogtle COL Supplemental EISs and the primary contributor to the water-related sections of the Bell Bend COL and PSEG ESP environmental impact statements. Dr. Meyer contributed to draft revisions of Regulatory Guide 4.2, the Environmental Standard Review Plan (NUREG-1515), and the Design-Specific Review Standard for mPower™ iPWR. As a member of the ANS-2.17 Working Group, Dr. Meyer contributed to the revised ANSI/ANS-2.17-2010 standard for evaluation of subsurface radionuclide transport at commercial nuclear

power plants. Dr. Meyer has also provided technical contributions to the NRC staff's reviews of flood hazard reevaluations at existing reactor sites.

Dr. Meyer is the author or coauthor of more than 20 peer-reviewed journal articles and more than 30 additional papers and reports.

Anne “Nancy” Kuntzleman
Statement of Professional Qualifications

Current Position

Aquatic Biologist
Environmental Technical Support Branch
Division of Site Safety and Environmental Analysis
Office of New Reactors
U.S. Nuclear Regulatory Commission

Education

M.S., Biology, University of Michigan, Ann Arbor, MI
M.S., Education, Temple University, Philadelphia, PA
B.S., Biology, Pennsylvania State University, University Park, PA

Qualifications

Ms. Kuntzleman is an aquatic biologist with over 40 years of experience in environmental compliance and environmental assessment for major Federal actions. Since joining the U.S. Nuclear Regulatory Commission (NRC) in June 2006, Ms. Kuntzleman has been responsible for oversight of aquatic and terrestrial technical reviews, as required by the National Environmental Policy Act (NEPA), to support licensing actions for new nuclear power plants. This involves reviewing and evaluating specific aspects of Environmental Reports submitted to the NRC by applicants and licensees and then assisting in the preparation an environmental impact statement (EIS). Ms. Kuntzleman’s duties also include updating the NRC environmental standard review plans for aquatic ecology contained in NUREG-1555, preparing biological assessments for Federally threatened or endangered species, and coordinating with Federal and/or State agencies pursuant to NEPA, Endangered Species Act (ESA), Sections 401 and 404 of the Clean Water Act (CWA), Section 10 of the Rivers and Harbors Act of 1899, Magnuson-Stevens Fishery Conservation and Management Act, Marine Mammal Protection Act, and Fish and Wildlife Coordination Act.

Ms. Kuntzleman has participated in numerous pre-application activities, acceptance reviews, site visits, site audits, and public meetings for new reactor licensing. She provided expert testimony during the Vogtle Early Site Permit (ESP) contested hearing. Currently she serves as the subject matter expert in aquatic ecology for the Bell Bend Combined License (COL) and PSEG ESP licensing reviews and is both the aquatic and terrestrial subject matter expert for the William States Lee III COL licensing review. She also provided oversight for preparation of the PSEG ESP Biological Assessments and Essential Fish Habitat (EFH) Assessments.

From October 1987 until June 2006, Ms. Kuntzleman was a senior biologist with the Department of the Navy, Engineering Field Activity Northeast (EFANE), a component of the Naval Facilities Engineering Command, Atlantic Division. For more than 18 years, Ms. Kuntzleman served as the sole professional/technical authority for EFANE in the preparation and coordination of all Department of the Army permit applications, Coast Guard permit applications, state wetland permit applications, and water quality certification applications for activities in waters of the United States (U.S.) and navigable waters of the U.S. within the regulatory authority of Sections 401 and 404 of the CWA; Sections 9 and 10 of the Rivers and Harbors Act of 1899; and Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972. In addition, Ms.

Kuntzleman also prepared federal consistency determinations pursuant to Section 307 of the Coastal Zone Management Act and Volume 15 of the Code of Federal Regulations, Part 930, Federal Consistency.

During her tenure at EFANE, Ms. Kuntzleman had signatory authority for permit applications and attendant issues including dredging and dredged material disposal, waterfront construction, and new construction in or adjacent to wetlands.

Concomitant with regulatory requirements, Ms. Kuntzleman prepared or evaluated environmental documentation or analyses (prepared by Navy contractors) conducted under NEPA, ESA, the Magnuson-Stevens Fishery Conservation and Management Act, Marine Mammal Protection Act, Fish and Wildlife Coordination Act, Executive Order 11988 (Floodplain Management), Executive Order 11990 (Protection of Wetlands), and Executive Order 13112 (Invasive Species).

As the Navy's technical representative, Ms. Kuntzleman developed scopes of work, prepared independent cost estimates, analyzed contractor proposals, participated in negotiations, and developed contract execution schedules for Navy contractors. She provided technical oversight, monitored work in progress, and evaluated each contractor's performance. Ms. Kuntzleman reviewed technical submissions for accuracy and interpreted biological, chemical, and other environmental test results during contractor preparation of a variety of environmental documents including NEPA environmental assessments and EISs, EFH assessments, coastal zone consistency determinations, 401 water quality certification applications, sediment sampling and testing plans for dredging projects, wetland delineations, wetland restoration plans, remedial action plans, and integrated natural resources management plans.

From September 1986 until September 1987, Ms. Kuntzleman taught life science and physical science at Northeast Junior High School, Reading, PA.

From July 1975 through August 1986, Ms. Kuntzleman was an aquatic ecologist for two environmental consulting firms under contract to Philadelphia Electric Company (PECO). She participated in all phases of the aquatic and terrestrial preoperational studies at the Limerick Generating Station (LGS), Limerick Township, PA. Ms. Kuntzleman also assisted in writing the procedures for collecting plant, mammal, sediment, and fish samples in conjunction with the Radiological Environmental Monitoring Program (REMP) at LGS and was responsible for coordinating the collection of the REMP sediment, vegetation, and fish samples.

Ms. Kuntzleman was also a field biologist for CWA Section 316(a) thermal plume investigations at two steam electric power stations on the Schuylkill River and for CWA Section 316(b) cooling water intake studies at four freshwater and seven estuarine steam electric power stations on the Schuylkill and Delaware Rivers, respectively. She assisted in the preparation of the 316(b) evaluations for Cromby Generating Station and Schuylkill Generating Station located on the Schuylkill River and Eddystone Generating Station and Edge Moor Power Station located on the Delaware River.

Later as an environmental educator, Ms. Kuntzleman developed and presented aquatic ecology and fish identification in-service training programs for elementary and secondary school teachers within the PECO service area. She also presented lectures to community groups, environmental organizations, and students explaining the environmental preoperational studies and monitoring requirements for LGS.

Ann L. Miracle
Statement of Professional Qualifications

Current Position:

Senior Scientist
Environmental Assessment Group
Earth Systems Science Division
Energy and Environment Directorate
Pacific Northwest National Laboratory
Richland, Washington

Education:

Ph.D., Molecular Immunology, University of South Florida
M.S., Molecular Genetics, University of Florida
B.A., Biology, University of Virginia

Qualifications:

Dr. Miracle is an aquatic ecologist with over 19 years of experience in aquatic ecology, NEPA, and protected species/habitat assessments, including the assessment of effects to aquatic resources from nuclear energy licensing and relicensing, renewable energy projects such as marine hydrokinetic systems, solar arrays, and hydropower. She has managed project teams and mentored staff for a number of programs over the last 10 years. Dr. Miracle has recently been appointed to serve as the Aquatic Ecology Subcommittee Chair under the Environmental and Siting Consensus Committee to develop new standards for aquatic resources under the American Nuclear Society.

Dr. Miracle has prepared technical reviews on aquatic resources for new nuclear reactor licensing for the Levy combined license application (COLA), V.C. Summer COLA, and the PSEG early site permit (ESP) application. She is currently preparing aquatic resource technical reviews for the Bell Bend COLA and the Turkey Point COLA. In addition, Dr. Miracle prepared the Endangered Species Act Section 7 consultation and Magnuson-Stevens Act Essential Fish Habitat assessments for the PSEG ESP, and has prepared similar documents for the other technical reviews previously identified. Dr. Miracle served as the project task lead for the technical preparation of the final Environmental Impact Statement for the Levy COLA, and currently serves as the project task lead for preparation of a programmatic Environmental Assessment for solar array installation for the U.S. Army.

Prior to her current position, Dr. Miracle worked for the U.S. Environmental Protection Agency and helped to develop molecular screening criteria for aquatic species in environmental risk assessments. Dr. Miracle's graduate research centered around physiology and conservation of commercially important and protected marine species found in coastal Florida waters. Dr. Miracle has authored or co-authored over 50 peer-reviewed journal, book chapter, report, and conference publications, and has served on the editorial board for 3 peer-reviewed journals.

Daniel C. Mussatti
Statement of Professional Qualifications

Current Position

Socioeconomist
Environmental Technical Support Branch
Division of Site Safety and Environmental Analysis
Office of New Reactors
U.S. Nuclear Regulatory Commission (NRC), Washington, D.C.

Education

M.A. Environmental Economics, University of Maryland, College Park, Maryland
M.S. Natural resource and Environmental Economics, University of Alaska Fairbanks, Fairbanks, Alaska
B.B.A. Economics, University of Alaska Fairbanks, Fairbanks, Alaska

Professional

Ten years of experience as the editor of the EPA Air Pollution Control Cost Manual

Qualifications

Mr. Mussatti is an Economist with nine years of experience in the NRC's Office of New Reactors. His work has focused on conducting reviews for new reactor environmental impact statements in the areas of socioeconomics, environmental justice, need for power, and benefit/cost balancing and in developing NRC guidance documents in these areas. Mr. Mussatti has participated in the environmental reviews for the Bell Bend, Calvert Cliffs 3, Comanche Peak 3 & 4, Fermi 3, Levy 1 & 2, North Anna 3, South Texas 3 & 4, Turkey Point 6 & 7, V.C. Summer 2 & 3, Vogtle 3 & 4, and Lee 1 & 2 COL applications and the PSEG ESP application. He was also responsible for drafting the following sections of the "Standard Review Plan for Environmental Reviews for Nuclear Power Plants" (NUREG-1555), "Preparation of Environmental Reports for Nuclear Power Stations" (Regulatory Guide 4.2), and "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (NUREG-1748): Socioeconomics, Environmental Justice, Need for Power, Benefit Cost Balance, and the analogous sections in the Cumulative and Alternative analyses. Mr. Mussatti also performed the Regulatory Analysis for "Regulatory Analysis for Proposed Changes to 10 CFR Part 171 "Annual Fees for Reactor Licenses and Fuel Cycle Licenses and Materials Licenses, Including Holders of Certificates of Compliance, Registrations, and Quality Assurance Program Approvals and Government Agencies Licensed by the NRC."

Prior to joining the NRC, Mr. Mussatti spent 15 years in various roles with the U.S. Environmental Protection Agency (EPA). Among his roles, he spent approximately 15 years as the EPA's senior economist for Regulatory Impact Analyses, Information Collection Requests, technical support documents, guidance documents, and white papers for Office of Air Quality Planning and Standards regulations and guidance. For 7 years, Mr. Mussatti lead and coordinated the EPA's cost estimation activities in support of the U.S. Department of Justice environmental enforcement actions against major coal-fired utilities. He also participated in the development and management of the Air Compliance Advisor, a \$2.5 million computer-based program for the prediction of pre- and post-control emission rates for a variety of polluting

industries, served as the EPA representative and liaison on the Interagency Task Force for establishing guidance for Executive Order 12898 on environmental justice, and led a team of economists and engineers to assess a new eight-hour ozone standard.

Jennifer A. Davis
Statement of Professional Qualifications

CURRENT POSITION

Senior Project Manager
Environmental Technical Support Branch
Division of Site Safety and Environmental Analysis
Office of New Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C.

EDUCATION

B.A., Historic Preservation/Classical Civilization, Mary Washington College

PROFESSIONAL

Duke University Environmental Leadership Courses: The Law of NEPA, Accounting for Cumulative Effects

The Shipley Group: Cultural and Natural Resource Management

National Preservation Institute: Integrating Cultural Resources in NEPA Compliance: Environmental Assessment, Cultural Resource Management and Historic Preservation Responsibilities and their Implementation Through the NEPA Process; Native American Graves Protection and Repatriation Act (NAGPRA) and Archaeological Resources Protection Act (ARPA): Applications and Requirements

SWCA Environmental Consultants: Issues in Section 106: Advanced

Advisory Council on Historic Preservation: The Section 106 Essentials, Section 106 – An Advanced Seminar, Managing Confidentiality and Section 304 of the National Historic Preservation Act (NHPA), NHPA Section 106 Process – Determination of Eligibility, Considerations in Tribal Interactions

QUALIFICATIONS

Ms. Davis has approximately 14 years of experience managing and participating in major, multidisciplinary environmental projects for the U.S. Nuclear Regulatory Commission (NRC) within the Offices of Nuclear Reactor Regulation (NRR), the Office of Federal and State Materials and Environmental Management Programs (FSME), the Office of Nuclear Material Safety and Safeguards (NMSS), and in the Office of New Reactors (NRO). This experience includes National Environmental Policy Act (NEPA) reviews and preparation of environmental impact statements (EISs). She also supports environmental reviews managed by other NRC staff, reviews NEPA documents prepared by others, analyzes and determines NEPA documentation requirements for nuclear facilities, and contributes to the development of guidance associated with the preparation of NRC NEPA documents. Ms. Davis also serves as a technical reviewer for the field of historic and cultural resources and National Historic

Preservation Act (NHPA) Section 106 compliance and has provided technical support to other program offices.

As a Senior Project Manager at the NRC, Ms. Davis has planned, led, and participated in major, complex multidisciplinary environmental reviews and development of guidance documents and EISs for licensing nuclear facilities under NRC regulations in Title 10 of the *U.S. Code of Federal Regulations* (10 CFR) Parts 40, 70, 51, and 54. During the PSEG review, Ms. Davis was the NRC's technical lead for the NEPA evaluation of impacts to cultural and historic resources and the NHPA Section 106 consultation, provided technical oversight of contractor staff, and served as one of the principle authors in developing the Memorandum of Agreement for the PSEG ESP Site.

Prior to joining NRO, Ms. Davis was a senior project manager in FSME and in NMSS. She was the EIS project manager for the General Electric-Hitachi Global Laser uranium enrichment facility near Wilmington, North Carolina. Ms. Davis also supported staff in finalizing the first three *in-situ* recovery (ISR) supplemental EISs and assisted project managers in Section 106 compliance. In addition, Ms. Davis assisted in the development of a MOA for the Nichols Ranch ISR project in Campbell and Johnson Counties, Wyoming. In NMSS, Ms. Davis was the technical reviewer responsible for the historic and cultural resources, socioeconomic, environmental justice, land use, and noise sections of NUREG-2157, *Generic Environmental Impact Statement for Continued Storage of Spent Nuclear Fuel*.

Prior to her appointment in FSME and NMSS, Ms. Davis served both as an environmental scientist and project manager in the Division of License Renewal (DLR) within NRR. Ms. Davis was the project manager for the update to *Generic Environmental Impact Statement (GEIS) for License Renewal of Nuclear Plants* (NUREG-1437, Volumes 1 and 2) and supported the associated rulemaking; lead project manager for Monticello license renewal application (NUREG-1437, Supplement 26); provided technical oversight/support for 25 license renewal reviews; authored historic and archaeological resource sections for Susquehanna, Beaver Valley, Three Mile Island, Kewaunee, Cooper, and Prairie Island supplemental EISs to NUREG-1437; developed NRC's "Section 106 through NEPA" approach used in both NRR and NRO licensing reviews, and provided technical support to other NRC program offices.

Prior to serving as an environmental scientist and project manager in DLR, Ms. Davis was a general scientist who supported environmental project managers in the assessment of environmental impacts associated with nuclear power plant operations and the preparation of EISs for license renewal and early site permit applications. Ms. Davis also attended and participated in technical conferences and seminars sponsored by the NRC and/or professional societies, for the purpose of emphasizing the safety and environmental impact of nuclear power plants while serving as a technical expert in the field of archaeology.

Prior to joining the NRC, Ms. Davis worked for Old Dominion University Research Foundation and served as their payroll coordinator. She also served as a field archaeologist for Louis Berger and Associates in 1996.

Daniel J. O'Rourke, RPA*
Statement of Professional Qualifications

Current Position

Natural and Sociocultural Systems Department
Environmental Science Division
Argonne National Laboratory

Education

M.S. Michigan Technological University, Industrial Archaeology, 1997
B.A. Michigan State University, History and Anthropology, 1991

Professional

*Register of Professional Archaeologists (RPA)
Society for Historical Archaeology
Society for Industrial Archaeology

Qualifications

1998-Present Principal Cultural Resource Specialist
Environmental Science Division
Argonne National Laboratory

Responsibilities at Argonne National Laboratory have included technical support to the Environmental Science Division (EVS), the Department of Energy, the Nuclear Regulatory Commission, Western Area Power Administration, the Bureau of Land Management, Bureau of Ocean Energy Management (formerly Minerals Management Service), and United States Air Force. Duties include developing/synthesizing historic contexts and assessing project impacts for environmental assessments (EAs) and environmental impact statements (EISs), preparing historical building evaluations and documentation reports, conducting archaeological surveys, and collecting data (e.g., through literature searches or field collection). Selected past projects include the NRC license renewal EIS's for the Vermont Yankee, Susquehanna, Duane Arnold, and Seabrook power plants, NRC licensing EIS's for the Eagle Rock Enrichment Facility and the GE Laser Enrichment facility, the West-Wide Energy Corridors EIS for the BLM, the Trans Alaskan Pipeline System right-of-way renewal EIS, the Imperial-Mexicali transmission line EIS, the BLM Wind Energy Programmatic EIS, and the URENCO USA uranium enrichment capacity enhancement EA. Co-author of numerous EAs for DOE and DOD facilities. Identify and manage cultural resources on Argonne site through archaeological survey, historic building evaluations, and development of cultural resource management plans. Support DOE and DoD cultural resource programs by compiling mitigation documentations for historic facilities (including nuclear facilities).

2000-2001

Project Director
Public Service Archaeology Program
Department of Anthropology University of Illinois at Chicago, 1007
West Harrison, Chicago, Illinois 60607.

Responsibilities involved the compiling of historical documentation for three buildings at the University of Chicago, the documentation and examination of the Ferris Wheel Foundation from the Chicago's Worlds Fair which was unearthed in 2000, and the archaeological assessment of the Pullman Water Tower Foundation for the University of Chicago. My duties included development of a research strategy, documentation of the remains, historical research, interviews, report preparation, and consultation with the State Historic Preservation Office (SHPO).

1999-2000

Project Archaeologist
Commonwealth Cultural Resource Group
2530 Spring Arbor
Jackson, Michigan 49203-3602

Directed and conducted archaeological surveys for the USDA Forest Service on the Ottawa National Forest and the Chequamegon National Forest. My duties included extensive field reconnaissance surveys, supervision of field personnel, documentation of all cultural resources observed, compilation of background historical information on survey areas, consultations with Forest Service personnel, and report preparation. I also assisted in archaeological excavations and field reconnaissance surveys for several private clients.

Research Interests

Understanding the regional effects of industry on natural resources and population dynamics.

Exploring the role of the history of technology in the development of modern society and industrial practices.

Publications

Author/Co-Author of 50+ technical reports and conference papers.

Donald Palmrose, Ph.D
Statement of Professional Qualifications

CURRENT POSITION

Senior Reactor Engineer
Radiation Protection and Accident Consequences Branch
Division of Site Safety and Environmental Analysis
Office of New Reactors
U.S. Nuclear Regulatory Commission
Washington, D.C.

EDUCATION

B.S., Nuclear Engineering, Oregon State University
M.S. Nuclear Engineering, Texas A&M University
Ph.D., Nuclear Engineering, Texas A&M University

PROFESSIONAL

Duke University, Nicholas School of the Environment, National Environmental Policy Act Certification Program

QUALIFICATIONS

Dr. Donald Palmrose is a Senior Reactor Engineer at the U.S. Nuclear Regulatory Commission (NRC) with responsibility for technical reviews and technical oversight of contractors for new reactor NEPA assessments. He has over 30 years of experience in the nuclear engineering profession. His expertise includes project management, operations, research, and technical review expertise in new reactor licensing reviews, National Environmental Policy Act (NEPA) assessments and documentation, regulatory analysis, risk assessments, nuclear safety analysis, radiation protection, U.S. Department of Energy nuclear safety management under 10 Code of Federal Regulation (CFR) Part 830, and five years of managerial and operational experience with the U.S. Navy surface nuclear propulsion program. Of particular note, Dr. Palmrose was an expert witness as a contractor to the NRC for a prior Atomic Safety Licensing Board hearing involving the NRC's National Enrichment Facility environmental impact statement.

As a Senior Reactor Engineer for the NRC, Dr. Palmrose serves as senior reviewer for new reactor 10 CFR Part 52 applications in the areas of environmental radiological dose analyses, nuclear power plant severe accident risks, and the evaluations of the transportation of radioactive materials. This includes information regarding nuclear power plant technology such as reactor systems, reactor core design, and evaluations of expected operating performance. Dr. Palmrose performs and coordinates the environmental reviews and evaluations of power reactor standard design certification, combined license and early site permit applications with the appropriate portions of the companion safety review to assure public health and safety and protection of the environment. He has also supported the review of operating reactors' license amendment requests involving reactor systems safety analyses. Additionally, Dr. Palmrose has also served as project leader and coordinator of other reviewers for the resolution of complex technical and licensing issues and provided expert technical assistance and advice relating to the safety aspects of the analysis of accident source terms and the environmental impact of severe accidents.

Neil R. Giffen
Statement of Professional Qualifications

CURRENT POSITION

Natural Resources Manager
Facilities and Operations Directorate
Oak Ridge National Laboratory
Oak Ridge, TN

EDUCATION

M.S., University of Maryland	Wildlife Management	1983
B.A., State University of New York	Environmental Science	1979

QUALIFICATIONS

Mr. Giffen has over 25 years of experience conducting environmental assessments. This work has included environmental impact analysis for proposed development projects and review of numerous environmental assessments and impact statements. Past reviews were conducted at the local level for residential and commercial projects, along with reviews conducted for the Department of Energy (DOE) and the Department of Defense (DoD). Mr. Giffen has also conducted numerous sensitive resources surveys to assess potential impacts on wildlife habitat, wetlands and other natural features in the environment. He has provided written input to a number of environmental assessments as a subject matter expert in terrestrial ecology and wetlands. Mr. Giffen currently oversees overall natural resource impact reviews of projects taking place on the DOE Oak Ridge Reservation, as the leader of a team of Oak Ridge National Laboratory (ORNL) subject matter experts in various areas of terrestrial and aquatic ecology.

Mr. Giffen has over 40 publications in the areas of wildlife and habitat management, as well as other areas of natural resource management.

Andrew J. Kugler
Statement of Professional Qualifications

Current Position

Senior Environmental Project Manager
Environmental Technical Support Branch
Division of Site Safety and Environmental Analysis
Office of New Reactors

Education

B.S. - Mechanical Engineering - Cooper Union - 1978
M.S. - Technical Management - Johns Hopkins University – 1998

Professional

Duke University, Nicholas School of the Environment, Certificate in the National Environmental Policy Act

Qualifications

Mr. Kugler has 15 years of experience managing and participating in major, multidisciplinary environmental projects for the U.S. Nuclear Regulatory Commission (NRC) within the Office of Nuclear Reactor Regulation (NRR) and the Office of New Reactors (NRO). This experience includes National Environmental Policy Act (NEPA) reviews and preparation of environmental impact statements (EISs). He also supports environmental reviews managed by other NRC staff, reviews NEPA documents prepared by others, analyzes and determines NEPA documentation requirements for nuclear reactor facilities, and contributes to the development of guidance associated with the preparation of NRC NEPA documents. Mr. Kugler also serves as a technical reviewer for the field of alternatives for almost all new reactor license applications.

As a Senior Project Manager in NRO, Mr. Kugler has planned, led, and participated in major, complex multidisciplinary environmental reviews and development of EISs for licensing of nuclear reactors under NRC regulations in Title 10 of the *U.S. Code of Federal Regulations* (10 CFR) Parts 51 and 52. He managed the project to update high priority portions of the Environmental Standard Review Plan (ESRP), completing the update of approximately 40 sections, including the Introduction (which includes guidance common to all sections), and the sections addressing energy alternatives and alternative sites. He also provided environmental insights to the 2007 rulemaking updating Parts 52 and 51, and provided comments for the 2007 rulemaking that modified the definition of construction.

Prior to the creation of NRO, Mr. Kugler managed environmental reviews for licensing and relicensing nuclear reactors in NRR. From 2003 to 2005 he was the Chief of the Environmental Branch in NRR, managing the NRC staff responsible for all environmental review activities in NRR. The branch's primary activities involved the review of multiple license renewal applications and the first three early site permit (ESP) applications. From 2000 to 2003 Mr. Kugler managed or supported teams performing environmental reviews of 10 license renewal and 2 ESP applications. Mr. Kugler developed and incorporated lessons-learned into staff review processes, including preparations for the first new reactor applications.

From 1995 to 2000 Mr. Kugler was a Project Manager in the Division of Licensing Program Management in NRR. He managed all licensing actions for Fermi 2, including 15 amendments issued over a 6-month period to support a refueling outage, and the conversion to the improved standard technical specifications. In addition, he led NRR activities related to dry cask storage, coordinating between the Regions, NRR, and the Office of Nuclear Material Safety and Safeguards for issues related to dry cask storage of spent fuel.

From 1990 to 1995, Mr. Kugler was a Reactor Engineer in the Generic Communications Branch in NRR. He prepared or managed the development of NRC generic communications (bulletins, generic letters, and information notices) on a broad range of technical issues. He also managed a major review of the closure of past technical issues and recommended action on a select few for which the NRC's closure had not been fully effective.

Prior to joining the NRC, Mr. Kugler worked for Gulf States Utilities at the River Bend Station. From 1987 to 1990 he supervised 16 system engineers who monitored the performance of all of the mechanical systems at River Bend, a BWR-6 design. He managed the inservice testing program, portions of the fire protection program, and the erosion/corrosion and motor-operated valve monitoring programs. He reviewed all major modifications and procedure changes as a voting member of the Facility Review Committee. Finally, he managed the on-site response (with the exception of the control room) to emergencies as the Technical Support Center Manager.

From 1983 to 1987 Mr. Kugler was a Senior Start-Up Engineer in the Preoperational Test Organization. He developed test procedures and directed preoperational testing for assigned systems (condensate and feedwater, closed cooling water). He also served as one of three shift test directors, responsible for coordinating all of the test activities of the various organizations (Stone & Webster, Preoperational Test Organization, Operations, and Maintenance). Among other activities, he supervised the integrated emergency core cooling systems test, initial fuel load, and initial criticality for the unit. As the test program came to a close, he entered the licensed operator training program and earned a senior reactor operator's license.

From 1978 to 1983 Mr. Kugler served in the U.S. Navy. After completing the nuclear training program, he taught enlisted personnel at the Nuclear Power School for a year. He was then assigned to submarine duty, qualifying as a diving officer and engineering officer of the watch (supervising the operation of the nuclear plant).

Kevin Quinlan
Statement of Professional Qualifications

CURRENT POSITION

Physical Scientist (Meteorologist)
Division of Site Safety & Environmental Analysis (DSEA)
Nuclear Regulatory Commission

EDUCATION

M.S. Atmospheric Science, University of Alabama in Huntsville (2008)
B.S. Meteorology, Millersville University of Pennsylvania (2006)

QUALIFICATIONS

Mr. Quinlan has been working in the Office of New Reactors at the U.S. Nuclear Regulatory Commission (NRC) since July 2008. He is, or has been, the lead NRC meteorological reviewer on eight combined license applications, two early site permit applications, and one design certification currently undergoing review by the NRC Staff. Mr. Quinlan has successfully testified in front of the Advisory Committee on Reactor Safeguards nine times and once before the Commission in a combined license mandatory hearing.

His work primarily includes the analysis of regional and local climatology to determine the most severe weather that may impact a potential reactor site or design. As part of his reviews, he inspects the meteorological instrument tower at each site to ensure that it provides accurate data for use in determining the correct atmospheric dispersion properties of the site. Since March 2013 he has been a lead reviewer on the NRC's near-term task force recommendation 2.1 reviews of Flood Hazard Reevaluation Reports.

Young-Soo Chang
Statement of Professional Qualifications

Current Position

Environmental Systems Engineer
Atmospheric Science and Climate Research Program
Environmental Science Division
Argonne National Laboratory, Argonne, Illinois

Education

Ph.D., Chemical and Materials Engineering, University of Iowa (1987)
M.S., Chemical and Materials Engineering, University of Iowa (1984)
B.S., Chemical Engineering, Seoul National University, Korea (1977)

Professional

Air & Waste Management Association (A&WMA), Member
Korean-American Scientists and Engineers Association (KSEA), Member
Korean Air Pollution Research Association (KAPRA), Member
Journal Reviewer: Atmospheric Environment; A&WMA; Water, Air, & Soil Pollution

Qualifications:

Dr. Chang is an environmental systems engineer with about 27 years of work experience. His primary responsibilities include air quality and noise impact analyses and human health risk assessments related to both energy development and cleanup projects for radiologically and chemically contaminated sites. With a graduate research specialty in air dispersion modeling, his expertise areas include meteorology and climatology, air quality, climate change, noise, risk assessment, emergency planning hazards assessment, and modeling for both routine and accidental releases as well as cooling tower and water quality impacts.

1988-Present Environmental Systems Engineer
 Environmental Science Division
 Argonne National Laboratory

Dr. Chang has contributed to a number of U.S. Nuclear Regulatory Commission (NRC) projects, providing technical evaluations that address meteorology and climatology, air quality, and climate change, as well as noise analyses and cooling tower modeling. Projects have included the generic environmental impact statement (GEIS) for license renewal of nuclear power plants, both main report updates and supplements (Byron, Davis-Besse, Diablo Canyon, Grand Gulf, Palo Verde, and Seabrook). He has also provided air quality modeling analyses for the EIS for the Eagle Rock Enrichment Facility. He was involved in the meteorology, air quality, and noise impacts analyses for environmental reviews for the URENCO USA Uranium Enrichment Facility, the GE-Hitachi Global Laser Enrichment Facility, and for the safety and environmental reviews for the Fermi combined license application (COLA). He participated in the air quality and meteorology reviews for the EIS for the PSEG early site permit (ESP) application review. He also worked on model validation by comparing commercial dense gas computer codes with the NRC's HABIT code, developed for evaluating the control room habitability following a postulated toxic gas release. He is currently participating in the development of the MILDOS-AREA computer code. Related to NRC's cooling tower impact analysis, he is currently participating in a technical advisory group (TAG) to assist in the upgrade of Electric Power Research Institute's (EPRI's) Seasonal/Annual Cooling Tower Impact (SACTI) Model.

Since joining Argonne in 1988, Dr. Chang has contributed to a considerable number of EISs, EAs, and research projects for federal agencies that range from the NRC, Department of Energy (DOE), U.S. Department of Agriculture (USDA), Western Area Power Administration (WAPA), Bureau of Land Management (BLM), Bureau of Ocean Energy Management (BOEM), Bureau of Reclamation (BoR), Bureau of Safety and Environmental Enforcement (BSEE), Forest Service (FS), Department of Homeland Security (DHS), U.S. Environmental Protection Agency (EPA), U.S. Air Force (USAF), and U.S. Army Corps of Engineers (USACE). He is responsible for air pollution modeling and impact assessments, related to conventional and renewable energy projects such as oil and gas both on land and on the outer continental shelf, coal-bed methane, oil shale and tar sands, nuclear, solar, wind, and oil and gas pipelines. In addition, he has conducted noise propagation modeling and noise impact assessments for major industrial facilities as well as for oil and gas exploration projects (including offshore). He is a key contributor to human health risk and other impact assessments associated with federal contaminated sites such as the DOE Weldon Spring Site and the USACE Niagara Falls Storage Site. He has also led the dense gas modeling of toxic air pollutants associated with accidental or intentional releases of chemical, biological, nuclear, and radiological (CBNR) agents. In addition, he also provides technical support for emergency planning hazards assessment (EPHA) project to evaluate chemical and radiological risks and develop emergency plans for buildings at Argonne and DOE sites.

1987-1988 Postdoctoral Fellow
Department of Chemical and Materials Engineering
University of Iowa, Iowa City, Iowa

Dr. Chang developed a regional-scale air quality model, the Sulfate Transport Eulerian Model-II (STEM-II). With this model he conducted extensive analyses of long-range transport of photochemical oxidants and acidic species over central Japan, in cooperation with the National Institute for Environmental Studies (NIES) in Japan. He also programmed an advanced chemistry mechanism for use in a three-dimensional mesoscale model (CALGRID) developed by the California Air Resources Board.

1986-1986 Visiting Scientist
National Institute for Environmental Studies (NIES), Tsukuba, Japan

As part of his graduate study, he joined the comprehensive meteorological and chemical species data collection field program to better understand the long-range transport of polluted air masses in central Japan. He constructed the emission inventories based on the traffic and fuel usage data for the area of interest for use as input to air quality modeling.

1972-1982 Plant Manager/Research Engineer
Agency for Defense Development (ADD), Daejeon, Korea

At ADD, he served as a plant manager/research engineer for manufacturing propellants and explosives on pilot and production scales. In this position, he was responsible for mechanical properties measurements of propellants and explosives, particle size analyses and controls for the components of propellants and explosives, and computer analyses of shell trajectories.

Publications:

Dr. Chang is author or coauthor of more than 130 publications, including peer-reviewed journal papers, conference papers, presentations to professional conferences and workshops, technical reports, and sponsor reports.

Steven J. Maheras, Ph.D, CHP
Statement of Professional Qualifications

CURRENT POSITION

Senior Scientist, Nuclear Sciences Division
Energy and Environment Directorate
Pacific Northwest National Laboratory

EDUCATION

Colorado State University: Ph.D., Health Physics	1988
Colorado State University: M.S., Health Physics	1985
University of New Hampshire: B.A. (cum laude), Zoology	1982

QUALIFICATIONS

For more than twenty years Dr. Maheras has managed multi-disciplinary, multi-organizational project teams in health physics and radioactive waste management. He has developed strategy and policy and contributed to numerous environmental impact statements (EISs), environmental assessments, safety analysis reports, and emergency planning hazards assessments. For the past three years Dr. Maheras has managed Pacific Northwest National Laboratory's Nuclear Fuels Storage and Transportation (NFST) Planning Project activities. As the lead for NFST's shutdown sites activities, Dr. Maheras has extensive knowledge of commercial spent nuclear fuel (SNF), SNF storage and transportation systems and technologies, and licensing, including the development of an Association of American Railroads Standard S-2043 railcar. He has briefed numerous audiences on NFST's shutdown sites activities, including the Nuclear Energy Institute, State and Regional Groups, the U.S. Nuclear Infrastructure Council, and the National Transportation Stakeholders Forum. Prior to involvement in NFST, Dr. Maheras managed Battelle's Yucca Mountain Repository Supplemental EIS, Nevada Rail Corridor Supplemental EIS, and Rail Alignment EIS transportation activities. Dr. Maheras also serves as a transportation subject matter expert for USNRC new reactor environmental impact statements.

Professional Experience

The Ohio State University, September 2005 – Present

- Lecturer in the Mechanical Engineering Department at the Ohio State University. Instructor for Nuclear Engineering 5776, Nuclear Fuel Cycles and Radioactive Waste Management; Nuclear Engineering 771, Radioactive Waste Management; Nuclear Engineering 6766, Nuclear Engineering Design; and Nuclear Engineering 606, Radiological Safety.

Senior Scientist – Battelle Pacific Northwest National Laboratory, March 2009 - Present

Senior Research Scientist – Battelle, March 2001 – March 2009

- Transportation analyst for U.S. Nuclear Regulatory Commission new nuclear reactor environmental impact statements. Performed radiological and nonradiological transportation risk assessments, conducted acceptance reviews, and participated in site audits for Levy County Units 1 and 2, Callaway Unit 2, and for the Early Site Permit for a new nuclear electric generating plant located adjacent to the existing Hope Creek Generating Station and Salem Generating Station Units 1 and 2.
- Principal investigator for the U.S. Department of Energy Nuclear Fuels Storage and Transportation (NFST) Planning Project shutdown site activities. Integrated the activities of project staff located in Columbus, Ohio; Richland, Washington; Tennessee, and South

Carolina and conducted assessments of 12 shutdown commercial nuclear power reactor sites (Maine Yankee, Yankee Rowe, Connecticut Yankee, Humboldt Bay, Big Rock Point, Rancho Seco, Trojan, La Crosse, Zion, Crystal River, Kewaunee, and San Onofre) to characterize the used nuclear fuel and greater-than-Class C (GTCC) low-level radioactive waste inventory at the shutdown sites; describe the on-site infrastructure and conditions relevant to transportation activities; evaluate the near-site transportation infrastructure and experience relevant to shipping transportation casks containing used nuclear fuel from the shutdown sites, including gaps in information; and evaluate the actions necessary to prepare for and remove used nuclear fuel and GTCC low-level radioactive waste from the shutdown sites. Briefed numerous audiences on NFST's shutdown sites activities, including the Nuclear Energy Institute, State and Regional Groups, the U.S. Nuclear Infrastructure Council, and the National Transportation Stakeholders Forum.

- Conducted detailed assessment of Association of American Railroads (AAR) Standard S-2043, *Performance Specification for Trains Used to Carry High-Level Radioactive Material*. This assessment included the history of the standard, a review of the standard's requirements, a comparison of the standard's requirements to requirements for other freight and passenger railcars, an overview of the use of multi-body simulation in railway vehicle design, a discussion of the settlement agreements between railroads and the U.S. Department of Energy and how these agreements are related to AAR Standard S-2043, a review of previous AAR Standard S-2043 railcar development projects, and a summary of potential issues during development of AAR Standard S-2043-compliant railcars.
- Conducted literature review of studies related to the vibration and shock associated with the normal conditions of transport for rail shipments of used nuclear fuel from commercial light-water reactors; conducted evaluation of using fill materials to fill void spaces in and around used nuclear fuel contained in dry storage canisters to stabilize the geometry and mechanical structure of used nuclear fuel during extended storage and subsequent transportation; and evaluated degradation mechanisms for structures, systems, and components for transportation systems to determine if they could be influenced by extended storage or high burnup, the need for additional data, and their importance to transportation.
- Principal investigator for the radiological and nonradiological transportation risk assessments contained in the *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0250F-S1, June 2008) (Repository SEIS). These transportation risk assessments included rail and truck transportation routing analyses, rail and truck transportation risk and consequence assessments, assessing the impacts of transportation sabotage and terrorism on rail and truck shipments of spent nuclear fuel, and transportation mapping.
- Principal investigator for radiological transportation risk assessments in the *Final Supplemental Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada—Nevada Transportation Corridor* (DOE/EIS-0250F-S2, June 2008) (Nevada Rail Corridor SEIS) and the *Final Environmental Impact Statement for a Rail Alignment for the Construction and Operation of a Railroad in Nevada to a Geologic Repository at Yucca Mountain, Nye County, Nevada* (DOE/EIS-0369, June 2008) (Rail Alignment EIS). These transportation risk assessments included rail transportation routing analyses, rail transportation risk and consequence assessments, and assessing the impacts of transportation sabotage and terrorism on rail shipments of spent nuclear fuel.

Gregory Zimmerman
Statement of Professional Qualifications

CURRENT POSITION

Research & Development Manager
Leader, Human Health Risk & Environmental Analysis Group
Environmental Sciences Division
Oak Ridge National Laboratory (ORNL)
Oak Ridge, Tennessee

EDUCATION

M.S., Mechanical Engineering, University of Tennessee (Knoxville)
B.S., Mechanical Engineering, University of Tennessee (Knoxville)

QUALIFICATIONS

Mr. Zimmerman has almost 40 years' experience at ORNL in the analysis of energy production and heat transfer technologies, risk and safety analyses, radioactive and other hazardous waste management, and environmental impact assessments. In the late-1980s he participated in the preparation of a Programmatic Environmental Impact Statement (EIS) for the U.S. Army's proposal to destroy the entire national stockpile of lethal chemical weapons, and he was subsequently assigned overall programmatic management responsibility at ORNL for the preparation of eight site-specific EISs related to that U.S. Army program.

Mr. Zimmerman's technical expertise has been applied to experimental investigations and technical studies focused upon (a) electric power generation using liquid metals instead of steam, (b) innovative heat transfer devices, (c) coal combustion and sulfur capture in fluidized beds, (d) wood gas generators for fueling internal combustion engines, and (e) coal technology characterization and discharges for estimating externalities of coal fuel cycles.

In addition to the aforementioned EISs for the U.S. Army, Mr. Zimmerman has served as the technical lead for and/or provided technical input to the following environmental documents: (a) an EIS for the NRC's review of a license application from Envirocare of Utah for an 11e.(2) byproduct disposal facility near Clive, Utah, (b) an environmental assessment (EA) for the NRC relicensing review of Nuclear Metals, Inc., in Concord, Massachusetts, (c) DOE Performance Evaluations of fifteen potential DOE mixed, low-level (radioactive) waste disposal sites; this project was a coordinated effort between ORNL and Sandia National Laboratories, (d) an EIS for the NRC licensing review of an application from Private Fuel Storage for an interim spent fuel storage installation in Skull Valley, Utah, and (e) an EIS for the NRC licensing review of two new nuclear reactors at the Comanche Peak nuclear power station in Texas.

Mr. Zimmerman has authored or contributed to over 50 reports and journal articles and has made numerous presentations at professional conferences and workshops. In addition, he has led or contributed to approximately 30 EISs and EAs prepared under the National Environmental Policy Act (NEPA).

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of)	
	)	Docket No. 52-043-ESP
PSEG POWER, LLC AND PSEG)	
NUCLEAR, LLC	)	ASLBP No. 15-943-01-ESP-BC01
)	
(Early Site Permit Application)	)	January 28, 2016

CERTIFICATE OF SERVICE

I hereby certify that the "NRC STAFF RESPONSE TO THE LICENSING BOARD'S SECOND SET OF QUESTIONS ISSUED JANUARY 6, 2016" has been filed through the E-Filing system this 28th day of January, 2016.

/Signed (electronically) by/
Kevin C. Roach
Counsel for NRC Staff
U.S. Nuclear Regulatory Commission
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