UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
OFFICE OF THE SECRETARY

ATOMIC SAFETY AND LICENSING BOARD PANEL

Before the Licensing Board:
G. Paul Bollwerk, III, Chairman
Nicholas G. Trikouros
Dr. James Jackson

In the Matter of	)	
	)	November 13, 2007
SOUTHERN NUCLEAR OPERATING CO.	)	
	)	Docket No. 52-011-ESP
(Early Site Permit for Vogtle ESP Site)	)	ASLBP No. 07-850-01-ESP-BD01

JOINT INTERVENORS ANSWER OPPOSING SOUTHERN NUCLEAR OPERATING CO.'S MOTION FOR SUMMARY DISPOSITION OF ENVIRONMENTAL CONTENTION 1.2

Joint Intervenors Center for a Sustainable Coast, Savannah Riverkeeper, Southern Alliance for Clean Energy, Atlanta Women's Action for New Directions, and Blue Ridge Environmental Defense League ("Intervenors") hereby respond to and oppose the summary disposition motion filed by Southern Nuclear Operating Company ("SNC"). SNC fails to demonstrate that there are no genuine issue as to any material fact regarding the Draft Environmental Impact Statement ("DEIS") adequately addressing Joint Intervenor's previously submitted Environmental Contentions 1.2 ("EC 1.2"), or that SNC is entitled to summary disposition as a matter of law. Consequently SNC's motion must be denied.

The facts show that summary disposition is inappropriate. SNC seeks summary disposition even though the DEIS issued on September 2007 contradicts their Statements of Undisputed Facts. Pursuant to NRC Rules of Practice, Intevenors reply to SNC's allegations regarding the status of genuine issues of material fact relating to EC 1.2. *See generally* 10 CFR

§§2.1205 and 2.710. Comment and/or citation to the attached Affidavit of Shawn Young Opposing Summary Disposition of SNC EC 1.2, Exhibit 'A' attached hereto (henceforth "Young Affidavit") and/or Affidavit of Barry Sulkin Opposing Summary Disposition of SNC and NRC's EC 1.2, Exhibit 'B' attached hereto (henceforth "Sulkin Affidavit"), and to other materials that form a part of the record of this case are appended to these replies.

As a matter of law, summary disposition is unavailable to SNC based on its pleadings. Here, SNC has failed to show that the opinions of the Intervenor experts are flawed or were addressed in the DEIS.

I. INTERVENOR'S RESPONSE TO SNC STATEMENT OF UNDISPUTED FACTS

In support of its motion to for summary adjudication, SNC submitted a statement of undisputed facts which purports to show that there are no genuine issues to be heard with respect to the material facts set forth in Contention EC 1.2. Intervenors hereby reply to the SNC's submission, indicating the existence of genuine issues of material fact in dispute regarding the substance and basis of Contention 1.2. Where Intervenors agree that no dispute exists, the statement is followed by the word "ADMITTED"; where the matter remains in dispute, the statement is followed by the word "DENIED," "ADMITTED IN PART AND DENIED IN PART," "DENIED INSOFAR AS," or "ADMITTED INSOFAR AS" and statement and/or reference for the basis of denial.

1. SNC submitted an Environmental Report ("ER") with its initial Early Site Permit ("ESP") application for two additional units at the existing Vogtle Electric Generating Plant ("PLANT VOGTLE") dated August 14, 2006. ADMITTED.

2. On December 11, 2006, Intervenors filed a request for hearing and petition to intervene, seeking to admit five contentions and subsequently designated all of those as environmental contentions. ADMITTED.

3. On January 10, 2007, SNC and the NRC Staff both responded to the petition, and on January 24, Intervenors filed their reply. On February 13, 2007, the Board conducted a pre-hearing conference regarding standing of the Intervenors and admissibility of their contentions. ADMITTED.

4. On March 12, 2007, the Board issued its Ruling on Standing and Contentions, and admitted EC 1.2 as follows: "The ER fails to identify and consider direct, indirect, and cumulative impingement/entrainment and chemical and thermal effluent discharge impacts of the proposed cooling system intake and discharge structures on aquatic resources." ADMITTED.

5. In admitting EC 1.2, the Board found that Intervenors' submission of Dr. Shawn Paul Young's declaration provided "sufficient factual support for the admission" of EC 1.2. March 27, 2007 Memorandum and Order (Ruling on Standing and Contentions) at 17. ADMITTED.

6. On September 10, 2007, as part of its NEPA obligations, the NRC staff released the Draft Environmental Impact Statement, ("DEIS"), which incorporated data from the original and subsequently revised ER, SNC's responses to the RAIs and information the staff compiled from other sources. Draft NUREG-1872. ADMITTED INSOFAR AS the DEIS does rely on data from the identified sources. Intervenors' state further that the DEIS does not correct or address the majority of deficiencies in the ER which formed the basis of Contention EC 1.2.

7. The NRC staff's description of SNC's proposed cooling system design for Vogtle Units 3 and 4 is accurate. DEIS §§ 3.2.2, 5.4.2.2. ADMITTED IN PART AND DENIED IN PART. Intervenors ADMIT the DEIS § 3.2.2 accurately describes the technical specifications of the proposed cooling system. Intervenors DENY that DEIS § 5.4.2.2 is an accurate description or analysis of the operational impacts of the proposed cooling water system on aquatic species. Intervenors further state that the description of water related impacts at DEIS § 5.3 does not address the magnitude of water withdrawals under low-flow conditions.

8. As support for EC 1.2, Intervenors assert that the ER does not include empirical data on the existing units' impact on the level of mortality from impingement and entrainment in the new intake structure. Young Affidavit ¶ A.9. ADMITTED.

9. Intervenors' assert that the ER does not include mortality rate data from the Department of Energy's Savannah River Site field studies on entrainment. Young Affidavit ¶ A.11. ADMITTED

10. Section 5.4.2.2 of the DEIS considers a number of factors, such as the type of cooling system proposed by SNC, the design and location of the intake structure, and the amount of water withdrawn from the source waterbody to estimate the degree of impingement and entrainment expected from the new intake structure.

a. With regard to entrainment, NRC staff relied on its evaluation of entrainment at Vogtle Units 1 and 2 in 1985 as part of its Final Environmental Impact Statement. That analysis concluded that a 1 to 3.5 percent removal proportion would have an insignificant effect on the drift organisms, aquatic community, and resident fish in the vicinity of Vogtle Units 1 and 2. In the DEIS, NRC staff concluded that a similar estimate could be applied to entrainment for proposed Units 3 and 4, because of the similarity in design for the cooling system. NRC staff noted that this estimate is considerably higher than would be anticipated under actual conditions. *NRC staff also acknowledged other studies that have been performed focusing on entrainment rates for reactor facilities at the DOE Savannah River Site between 1982 and 1985 which estimated that between 8.3 and 12.3 percent of the ichthyoplankton that drifted past the canals were entrained.* NRC staff distinguished these studies stating that there were significant differences between the DOE Savannah River Site intakes and the existing and proposed intakes at Vogtle, namely, the volume of water withdrawn, the length of the intake canals and the intake velocity. The NRC staff concludes: "Based on the percentage of water withdrawn, the planned low-through-screen intake velocity, the closed-cycle cooling system design, the typically high fecundity of most species inhabiting rivers, the existence of multiple spawning sites within the river basin, and the high natural mortality rates of eggs and larvae, the staff finds that the impacts to the fish of the Savannah River from entrainment would be minor." DEIS at 5-23 – 5-25. ADMITTED INSOFAR AS the above-quoted language accurately describes the discussion and conclusions of the DEIS. Intervenors DENY that using withdrawal as a percentage of river flow is a valid methodology for evaluating impacts of cooling water intakes. Intervenors state further that this methodology relies explicitly on the assumption of a uniform drift community, which is contrary to the data collected during pre-operational field studies at Plant Vogtle. Young Affidavit ¶¶ 9-10, 21.

b. With regard to impingement, NRC Staff concluded that because the proposed design of the intake canal and structure and its placement relative to the Savannah River was similar to that of the existing Units 1 and 2, the impacts would reasonably be expected to be similar. NRC staff relied on its site visit to Vogtle Units 1 and 2 on March 8, 2007 which included an investigation of the intake and an examination of the traveling screens, the screen wash system, the debris trough that collects and channels debris washed from the screens and the collection debris basket, to conclude that impacts from impingement of fish for Units 3 and 4 would be minor. NRC staff also relied on SNC's obligation under its Environmental Protection Plan for Units 1 and 2 to notify NRC of any unusual environmental events, including fish kills or impingement events and the fact that SNC had not, to date, submitted any such report. DEIS at 5-26. ADMITTED IN PART AND DENIED IN PART. Anecdotal reporting and a single observation inadequate to conclude minor impacts to fish. Young Affidavit ¶ 14.

11. As support for EC 1.2, Intervenors assert that the ER does not calculate the worst-case scenarios for quantifying entrainment or thermal impacts. ADMITTED.

12. Section 5.4.2.2 of the DEIS discusses the effect on entrainment of the percentage of flow of the Savannah River that is withdrawn. The DEIS considers the maximum withdrawal rate at varying river flows, including Drought Level 3, the maximum measurable drought. With respect to thermal discharges, the NRC staff used the Drought Level 3 flow rate and concluded that the size of the thermal plume is small in comparison to the width of the Savannah River. ADMITTED IN PART AND DENIED IN PART. DEIS §§ 5.4.2.2 and 5.4.2.3 assume that the minimum flow at the Plant Vogtle site will be the Drought Level 3 discharge from Thurmond Dam, 70 miles upstream. The DEIS does not account for natural increase, or municipal and industrial withdrawals and diversions between Thurmond Dam and Plant Vogtle. The DEIS does not address flows at the Plant Vogtle site under Drought Level 4 conditions. Intervenors DENY the characterization of Drought Level 3 as the "maximum measurable drought." See Sulkin Affidavit ¶¶ 19-22, 25.

13. Intervenors assert that the ER does not use maximum withdrawal rates from the existing units to estimate cumulative withdrawal impacts. Young Decl. ¶ A.14. ADMITTED. See Sulkin Affidavit ¶ 22.

14. Table 7-1 of the DEIS provides maximum withdrawal rates for Units 1 and 2. DEIS at 7-4. These data are based on the maximum physical capacity of the intake pumps, as reflected in the Vogtle Units' 1 and 2 FES, and cannot be exceeded. Section 7.3.1.1 assumes maximum withdrawal rates. DENIED. Table 7-1 shows normal withdrawal rates, not maximum withdrawals. See Staff Memo at 8; Staff Affidavit ¶¶ 10-11; Sulkin Affidavit ¶¶ 18-19, 21.

15. As support for EC 1.2, Intervenors assert that the ER does not quantify or describe systematically the species composition and habitat in the vicinity of the intake and cooling structures. Young Affidavit ¶ A16. ADMITTED

16. In section 2.7.2.1 of the DEIS, the NRC Staff states that the potential for impacts from operation of the proposed Units 3 and 4 to aquatic biota would be primarily to organisms inhabiting the Savannah River and lists these as: attached algae and aquatic macrophytes, diatoms, benthic macroinvertebrates (including mussels, clams, aquatic insects), mollusks, and fish. Relying on biological and water-quality studies of the area of the Savannah River adjacent to Vogtle conducted by the Academy of Natural Sciences of Philadelphia (ANSP) for the DOE's Savannah River Site, NRC Staff systematically describes these aquatic biota. *See* DEIS 2-73 – 2-91. Table 2-7 lists all of the native, resident, diadromous, marine and upland fish species in the Middle Savannah River (as taken from Marcy et al.). The Staff cites to nine different studies they consulted to describe the shortnose sturgeon and its composition near Vogtle. DEIS at 2-87 – 2-91. The Staff relied on a report by Bailey et al. to quantify the American shad population that had reached the New Savannah Bluff Lock and Dam. DEIS at 2-80. The ER referenced four different studies, all made available to the NRC Staff, which described and quantified the blueback herring population in the Savannah River near Vogtle. ER §§ 2.4, 5.3. ADMITTED IN PART AND DENIED

IN PART. Intervenors ADMIT that the above-quoted language is an accurate summary of DEIS § 2.7.2.1. Intervenors DENY that DEIS § 2.7.2.1 accurately describes the species composition and habitat at the Plant Vogtle site. Intervenors state further that the DEIS lacks important information on species' life history stage, abundance or distribution, migration timing, population numbers for fish in the immediate vicinity of Plant Vogtle, and uses faulty assumptions. See Young Affidavit ¶¶ 6, 8-9, 21-22.

17. As support for EC 1.2, Intervenors assert that the ER does not quantify the potential impacts on the aquatic drift community from the cooling system thermal discharges. Young Decl. ¶ B.20, 21. ADMITTED

18. Sections 5.3.3.1 and 5.4.2.3 of the DEIS include a discussion of NRC staff's thermal impact assessment using CORMIX model to estimate the size and temperature of the thermal plume from the existing Units 1 and 2 as well as the proposed units 3 and 4. Section 7.5 quantifies the size of the thermal plume as 29.6 m long by 4.6 m wide, with a temperature increase of five degrees. DEIS at 7.15. The NRC staff also concludes that cold shock mortalities would be less likely at Vogtle because it is a multiple unit plant and the comparison of the volume of the discharge to the flow of the river is very small, both factors considered to decrease the likelihood of cold shock mortalities. ADMITTED IN PART AND DENIED IN PART. At Drought Level 4, the thermal plume is greater relative to the size and flow of the river. See Sulkin Affidavit ¶ 25.

19. As support for EC 1.2, Intervenors assert that the ER does not disclose whether chemical constituents in the liquid effluent will be discharged at harmful levels. Petition at 12. ADMITTED.

20. Section 5.4.2.4 of the DEIS discusses the chemical impacts expected from the chemical treatment of the cooling water. Table 5-4 of the DEIS provides a list of the water treatment chemicals, their use, the concentration that is anticipated to be discharged from Units 3 and 4 and the toxicity data from the Material Safety Data Sheets for each of those chemicals. NRC staff summarizes that the concentrations expected in the discharge are significantly lower than the LC50 (the concentration that kills 50% of the sample population) and that the water flow from the Savannah River would further dilute the concentration of these chemicals. DEIS at 5-27 – 5-28. ADMITTED.

21. As support for EC 1.2, Intervenors assert that there is no evaluation of the cumulative impacts of acute or chronic toxicity of the existing discharge. Petition at 13. Section 7.5 of the DEIS identifies and considers any adverse cumulative impacts that potentially would result from construction and operation of the proposed Units 3 and 4. Based on the Staff's assessment of Units 1 and 2 existing Clean Water Act obligations, the Staff specifically states in the DEIS that the potential cumulative impacts from chemical releases "would not negatively impact aquatic organisms . . . and are considered by the staff to be minor." DEIS at 7-16. ADMITTED.

22. DEIS Section 5.4.2, entitled "Aquatic Impacts" contains eight pages of discussion of the potential impacts of the Vogtle units on aquatic ecosystems, including impingement and entrainment (pages 5-23 – 26), thermal impacts (pages 5-26 – 27), and chemical impacts (pages 5-27 – 29). Sections 2.7.2.1 and 2.7.2.2 contain 20 pages of discussion addressing the existing aquatic ecosystem, and Section 7.5 identifies and considers the cumulative impacts on the aquatic ecosystem. ADMITTED IN PART AND DENIED IN PART. The DEIS lacks important information on species' life history stage, abundance or distribution, migration timing, population numbers for fish in the immediate vicinity of Plant Vogtle, and uses faulty assumptions regarding minimum flows and maximum withdrawals. See Young Affidavit ¶¶ 6, 8-9, 21-22.

23. Many of the studies and resources relied on and referenced in the DEIS are field studies performed on the Savannah River near the Vogtle site, including the ANSP studies identified in section 2.12 and the Paller and SRS studies identified in section 5.13. ADMITTED IN PART AND DENIED IN PART. The ANSP studies, discussed in DEIS § 2.12, and the Paller and SRS studies, discussed in DEIS § 5.13 were conducted *near* Plant Vogtle; however, none of the studies include detailed, site-specific information on species' life history stage, abundance or distribution, migration timing, or population numbers for fish at the Plant Vogtle site. Similarly, the ANSP studies are limited in frequency and the species sampled, and were not designed to evaluate the potential impacts of adding new units at Plant Vogtle. See Young Affidavit ¶ 17.

24. Page 5-25 of the DEIS addresses the assumption of uniformity in the drift community and states that "[e]ggs of many freshwater riverine fish are adhesive, demersal or semi-buoyant. And early larval stages may tend to remain near the bottom of the river of otherwise not be susceptible to transport into the [intake] canal." ADMITTED IN PART AND DENIED IN PART. Intervenors ADMIT that, in general, eggs of many freshwater riverine fish are adhesive, demersal or semi-buoyant, and early larval stages may tend to remain near the bottom of the river of otherwise not be susceptible to transport into the intake canal. Intervenors DENY that the existing and proposed Plant Vogtle intake structures do not have the potential to entrain significant numbers of fish eggs and larvae. Intervenors state further that pre-operational studies at Plant Vogtle found that eggs and larvae are a large component of the drift community at certain times of year. Despite evident to the contrary, the DEIS wrongly assumes that the larvae of fish that spawn in the gravel do not become part of the drift community. See Young Affidavit ¶ 22.

II. ARGUMENT

A. Legal Standards for Summary Disposition

Summary disposition is appropriate "if the filings in the proceedings, depositions, answer to interrogatories and admissions on file, together with the statements of the parties and the affidavits, if any, show that there is no genuine issue as to any material fact and the moving part is entitled to a decision as a matter of law." 10 C.F.R. §§ 2.1205(c), 2.710(d)(2). Summary disposition motions under 10 C.F.R. § 2.749 (the equivalent rule prior to the revision of 2004) should be evaluated under the same standards as motions made under Federal Rules of Civil Procedure, Rule 56. *Advanced Med. Sys., Inc*, CLI-93-22, 38 N.R.C. 98, 102 (1993).

SNC faces a high burden of persuasion in this proceeding. As the moving party, SNC bears the burden of proving the absence of a genuine issue of material fact. *Adickes v. Kress & Co.*, 398 U.S. 144, 157 (1970); *Duke, Cogema, Stone and Webster* (Savannah River Mixed Oxide Fuel Fabrication Facility) LBP-05-04, 2005 NRC LEXIS 16, at *11 (2005). Because the burden of proof is on the movant, the evidence submitted "must be viewed in the light most favorable to the opposing party." *Id.*; *Advanced Medical Systems. Inc.* (One Factory Row, Geneva, Ohio 44041), CLI-93-22, 38 NRC 98, 102 (1993); *Dr. James E. Bauer* (Order Prohibiting Involvement in NRC Licensed Activities), LBP-95-7, 41 NRC 323, 329 (1995). Where a moving party shows a lack of material dispute, the party opposing summary disposition must respond by setting forth specific facts showing there is a genuine issue. 10 C.F.R. § 2.710(b). A genuine issue is one in which "the factual record, considered in its entirety, must be enough in doubt so that there is a reason to hold a hearing to resolve the issue." *Cleveland Elec. Illuminating Co.* (Perry Nuclear Power Plant, Units 1 and 2), LBP-83-46, 18 N.R.C. 218, 223 (1983).

Where there are material disputes based on sound expert opinion summary disposition in unavailable, as the Commission has explained:

> Where there is disagreement among competing experts over material facts, Summary judgment may not be appropriate if it would require the trier of fact to untangle the expert affidavits and decide which experts are more correct. In that case, a hearing, if permitted by the applicable procedures, is the appropriate forum for the trier of fact to weigh the competing expert opinions on material facts.

Duke Cogema at 15.

Once an applicant has submitted a motion that makes a proper showing for summary disposition, the litmus test of whether or not to grant the summary disposition motion is whether the Intervenors have presented a genuine issue as to any material fact that is relevant to its allegation that could lead to some form of relief. *Georgia Power Compan*y (Vogtle Electric Generating Plant, Units 1 and 2) LBP-94-37, 40 NRC 288 (1994). Any doubt as to whether the parties should be permitted or required to proceed further requires a denial of the motion. *General Electric Co.* (GE Morris Operation Spent Fuel Storage Facility), LBP-82-14, 15 NRC 530, 532 (1982); *Safety Light Corn.* (Bloomsburg Site Decommissioning and License Renewal Denials), LBP-95-9, 41 NRC 412, 449 n. 167) citing *Anderson v. Liberty Lobby. Inc.*, 477 U.S. 242, 248 (1986).

As discussed in more detail below, summary disposition at this stage is inappropriate because SNC's motion for summary disposition does not meet the movant's burden to show that there are no material issues in dispute, nor is the SNC entitled to summary adjudication as a matter of law.

B. Summary Disposition Is Inappropriate When There Are Material Facts In Dispute

SNC, as the moving party, bears the burden of proving that there is no genuine issue of material fact, even when the facts are viewed in the light most favorable to Joint Intervenors. *Adickes v. Kress & Co.*, 398 U.S. 144, 157 (1970). It has failed to do so. This contention was admitted by the ASLB because sufficiently reliable evidence was presented in the form of references to the record and expert affidavits to prove that genuine disputes of material facts existed. *Memorandum and Order*, ASLB, LBP-07-03, March 12, 2007. SNC incorrectly assert that is no genuine dispute of material fact concerning Environmental Contention ("EC") 1.2. (SNC Motion for EC 1.2 at p. 1-2, NRC Motion for EC 1.2 at p. 1). With limited exceptions, the DEIS fails to address EC 1.2, and merely repeats the same flawed analysis of the ER. Thus, the material disputes recognized by the ALSB have not yet been remedied.

1. Whether the DEIS Adequately Analyzed the Impacts to Aquatic Resources is in Material Dispute

SNC argues that the DEIS has addressed both the first Young Declaration and fulfilled NEPA's requirements so that there is no material dispute with regard to the impacts on aquatic resources. However, as demonstrated in the attached affidavits of Dr, Shawn Young and Barry Sulkin, neither the DEIS nor the recently submitted NRC Staff Joint Affidavit adequately resolve the factual disputes identified in EC1.2. Since the DEIS and Joint Affidavit failed to adequately respond to EC 1.2, summary adjudication is inappropriate.

First the DEIS' discussion of Plant Vogtle's impact on fish is insufficient to warrant summary judgment on this issue. Studies of fish in the vicinity of Plant Vogtle have been sporadic, especially considering that fish that occur in the Plant Vogtle area include several species of concern and state and federally listed species (and potential federally listed species).

The last fish study conducted in the vicinity of Plant Vogtle was conducted in 1996, DEIS at 2-79, and that study was not designed to evaluate the impacts of the proposed new units. No detailed data has been presented for Savannah River fish (1) life history stages that will occur near Plant Vogtle, (2) respective migration timing of each species past Plant Vogtle, (3) distribution patterns in the vicinity of Plant Vogtle, or (4) population numbers, Young Affidavit ¶ 6, which is crucial for adequately analyzing impingement and entrainment impacts. Certain life stages of fish are particularly vulnerable, and these fish may be present when Plant Vogtle operations are likely to have the greatest impact. Thus, the DEIS fails to include "the temporal and spatial (including depth) distribution and abundance of "important" aquatic species, especially in the discharge area and receiving water body. Such critical life-support requirements as spawning areas, nursery grounds, food habits, feeding areas, wintering areas, and migration routes." ESRP 2.4.2-3. The information presented consists of a general list of fish species found in the Savannah River that does not reveal a species' abundance, distribution or life history stage when it may be within the area of Plant Vogtle. Young Affidavit ¶ 8. The individual life history stages and population numbers of fish by Plant Vogtle is material issue that has not been resolved by the DEIS.

Second, the DEIS wrongly assumes a uniform distribution of fish eggs and larval fish in the Savanah River near Plant Vogtle. Field studies have shown that fish eggs and larval fish are non-uniformly distributed and indeed variable over time and space in the vicinity of Plant Vogtle; some species occurrence was more prevalent in certain months, and some species occurred more frequently in specific positions in the water column. Young Affidavit ¶ 10. The DEIS, at 5-23, recognizes that the drift community is an important consideration to analyze, yet the DEIS ignores the data available on drift community. Young Affidavit ¶ 21. The DEIS, at 5-

25, and Joint Affidavit, at ¶ 15, attempt to justify the assumption of a uniformly distributed drift community, yet fail to account for the actual field data of the drift community near Plant Vogtle. Young Affidavit ¶ 10. By using a percentage of flow diverted as a proxy for field studies in tandem with a non-uniform, the DEIS' methodology is fatally flawed. The DEIS does not "estimate the magnitude of the potential impingement and entrainment impacts on the species populations and aquatic ecosystem," ESRP 5.3.1.2-7, but merely extrapolates from the percentage of total river flow that will be withdrawn, Young Affidavit ¶ 20. SNC has not studied the impacts of the current intake, yet the DEIS predicts that the new units will have similar impacts. Whether the DEIS can properly assume a uniform drift community, or should instead consider a more accurate non-uniform drift community in considering the impacts to aquatic resources is a material issue of fact.

Third, there has not been any monitoring of current impacts of the existing units to fish in the vicinity of Plant Vogtle, and thus the ability to confirm the conclusions made by the DEIS that projected impacts will be minor is in question, and can not be resolved by summary adjudication. The ANSP studies that the DEIS cite are insufficient to qualify as monitoring, since they do not contain many basic life history information for the species reported. Young Affidavit ¶ 13. Furthermore, the ANSP used to survey a diverse array of different species, but since 1997, the survey has been limited to diatoms only. DEIS at 2-73. Monitoring only diatoms is not sufficient for determining the overall health of the river near Plant Vogtle, or the impacts of current and proposed units. Young Affidavit ¶ 17. In addition, the DEIS does not provide "an analysis of at least one full year of data to reflect seasonal variations in aquatic populations." ESRP 2.4.2-6. Thus the baseline conditions at Plant Vogtle, including impacts of the existing units, are a disputed issue of material fact.

Similarly, without any monitoring of current impacts, the DEIS conclusion that Units 3 and 4 will have similar impacts is meaningless. The DEIS relies on a single site visit observation on March 8, 2007 of the intake and screens to conclude negligible impact. See SNC's Undisputed Facts, at 3 ¶ 10, and Joint Affidavit ¶ 16. Similarly, though the affidavit also reports that "the screen wash collection baskets were cleaned about two or three times each of the past two years and no fish were seen," Joint Affidavit ¶ 16, these cleanings may have coincided with times of low fish population and presence, and cannot be independently verified. Thus, a single visit and anecdotal reports do not support a conclusion of minor impacts. Young Affidavit ¶ 14.

Fourth, the DEIS and Joint Affidavit also mistakenly assumes greater mobility of fish eggs and larval, severely underestimating the impacts from entrainment. In fact, fish eggs and larvae have virtually no mobility and are thus most susceptible to entrainment and thermal discharge. Young Affidavit ¶ 9. Paragraph 15 of the Joint Affidavit downplays the susceptibility of egg and larval fish to water withdrawal and thermal discharge by erroneously claiming that, "larval fish are capable swimmers and appear to avoid high flow rates." Rather, larvae fish exhibit mobility on a very small-scale in time and space. Young Affidavit ¶ 9. At best, some larval fish are more capable swimmers than others, but it is incorrect to assume that these larval fish can avoid impacts of existing or proposed units. Young Affidavit ¶ 10. Furthermore, though larval fish can respond to naturally occurring flow regimes, these fish are not adapted to overcome human-induced flow variability. Young Affidavit ¶ 12. For example, as discussed in DEIS 5-23 – 5-26, design through-screen velocity would be 0.5 ft/sec, equivalent to 6 inches/sec. However DEIS 2-83 cites literature that larval fish (robust redhorse) are capable of swim speeds of 3-5 inches/sec, which is insufficient to avoid the water intake velocities as stated in the DEIS. Young Affidavit ¶ 10.

Similarly, the DEIS, at 2-83, wrongly assumes that since robust redhorse suckers spawn in the gravel, their larval fish would not be part of the drift community susceptible to entrainment or thermal discharge. However a field study found that larval suckers like the redhorse comprised a large part of the larval drift community, and could be negatively impacted by impingement and entrainment. Young Affidavit ¶ 16. Here, the DEIS and Joint Staff Affidavit fail to sufficiently consider the impact of Plant Vogtle on "important species," such as the redhorse. With a non-uniform distribution, entrainment of important species could be significantly higher at certain times of the year. Young Affidavit ¶¶ 21, 27. The DEIS fails to "estimate the magnitude of the potential impingement and entrainment impacts on the species populations and aquatic ecosystem," as required in the ESRP 5.3.1.2-7, and bases its conclusion on the percentage of water withdrawal. The NRC staff has not conducted an "analysis of the effects of entrapment, impingement, and entrainment in sufficient detail to allow the review to predict important potential impacts on important species,'" ESRP 5.3.1.2, such as the redhorse, a state listed species. (*See also* Regulatory Guide 4.7, Rev. 2, *General Site Suitability for Nuclear Power Stations* (NRC 1998)) Therefore, the magnitude of potential impacts to vulnerable life history stages of fish and other aquatic species is a material issue of fact with respect to the DEIS under-estimation of entrainment and impact to aquatic resources.

2. Whether the DEIS Adequately Considered the Impacts From Low River Flow, Specifically Drought Level 4, to Aquatic Resources is in Material Dispute

Rather than using scientifically accepted methodology for surveying and estimating impacts on aquatic species, the DEIS repeatedly points to the percentage of total Savannah River flow that will be withdrawn or discharged as a means of estimating impacts. This leads the NRC Staff to conclude that impacts to aquatic species are small because the current and proposed

withdrawal and discharge will be small when compared with the total river discharge at PLANT VOGTLE. *See* DEIS at 5-7, 5-13 – 5-16, 5-23 – 5-25, 7-3 – 7-5. However, the DEIS does not analyze impacts across "the monthly and annual ranges and averages, and the historical extremes of the physical and hydrological characteristics of the hydrosphere potentially affecting or affected by plant construction and operation." NRC, Environmental Standard Review Plan, NUREG-1555, § 2.3.1.

The DEIS bases its "small impact on aquatic species" conclusion on insufficient and suspect data, for the following reasons. Instead of analyzing ranges over time and historical lows, the DEIS assumes that the flow at Plant Vogtle will not fall below the Drought Level 3 discharge at Thurmond Dam, more than 70 miles upstream. The DEIS does not consider Drought Level 4 conditions, although such conditions are reasonably likely to occur in the future. The DEIS does not analyze observed minimum flows at the USGS Jackson gage, only six miles upstream from Plant Vogtle. In a similar pattern, the NRC Staff now concedes that the DEIS did not analyze cumulative maximum withdrawals, and that such withdrawals will exceed the threshold of significance identified in the DEIS.

The record does not support the conclusion of the NRC Staff. The DEIS uses suspect and inaccurate information on which to base the conclusion that the impacts of the water use of proposed Units 3 and 4 alone, and cumulatively, will be small. DEIS at 5-7, 7-4. As addressed in the affidavit of Barry W. Sulkin, the information provided in the DEIS discussing the use of water by the proposed Units 3 and 4, and Plant Vogtle overall, is understated and contains discrepancies, and is therefore suspect. *See* Sulkin Affidavit.

First, the low flow estimates, when Plant Vogtle withdrawals will have the greatest impact, are inaccurate. They are based on releases from the Thurmond Dam 71 miles upstream.

However, there is no basis stated in the DEIS to assume flows at the Vogtle site will be the same as the discharge from dam, especially considering the numerous withdrawals and discharges in between. Sulkin Affidavit ¶ 11, 12. The DEIS is also inconsistent in use of its data when it uses low flow data taken from the Thurmond Dam, but average flow data taken from the gage at Jackson, closer to Plant Vogtle. Sulkin Affidavit ¶ 13. The minimum low flow measured at Jackson (3,220 cfs) is considerably lower then the Drought Level 3 flow taken at Thurmond Dam (3,800 cfs), and use of this data would alter the conclusions based on these numbers. Sulkin Affidavit ¶ 9.

Second, only Drought Levels 1-3 are analyzed by the DEIS and Drought Level 4 is ignored. Drought Level 4, when impacts would be greatest, is mentioned but not taken into account when determining impacts, even though this data could easily be obtained from the Army Corps of Engineers. Sulkin Affidavit ¶ 15-19. Flows below Drought Level 3 are reasonably foreseeable. The Drought Contingency Plan includes Drought Level 4, with discharge even lower than the 3,800 cfs under Drought Level 3. Sulkin Affidavit ¶ 14. Obviously, Drought Level 4, and lower flows, must be foreseeable because the Corps addresses such conditions in the Drought Contingency Plan. The Drought Contingency Plan does not place a hard limit on minimum flow; there is nothing to stop the Army Corps from releasing flows lower than 3,800 cfs. Sulkin Affidavit ¶ 14. In fact, the observed historical low flow at the USGS Jackson gage is 3,220 cfs. Sulkin Affidavit ¶ 9, 20.

Since flows lower than Drought Level 3 are foreseeable, the NRC Staff must obtain the information unless the cost of obtaining it is exorbitant. 40 C.F.R. § 1502.22(a). If the Staff determines cost would be too exorbitant, they must still include in the DEIS their evaluation of such impacts based upon theory or generally accepted research methods. 40 C.F.R. §

1502.22(b)(1). The Drought Contingency Plan indicates that the Army Corps conducted computer modeling, which is the standard method of estimating discharge from reservoirs. The NRC Staff could easily obtain this data from the Army Corps, but has neglected to do so. The Drought Contingency Plan also suggests that minimum flow will be at least 3,600 cfs. The observed flow at the Jackson gage is also a reasonable indicator of likely minimum flow at Plant Vogtle. Sulkin Affidavit ¶ 15-19. The DEIS incorrectly asserts that Drought Level 4 flows are not determinable. Thus, there is a factual dispute concerning the likelihood and extent of low-flow conditions at the Plant Vogtle site.

In order to adequately consider surface water impacts, the probability and frequency of Drought Level 4 conditions must be analyzed. Sulkin Affidavit ¶ 16. Projections based on Drought Level 3 will not adequately consider surface water impacts, or related impacts on aquatic species. Sulkin Affidavit ¶ 16. Similarly, if Drought Level 4 occurs at significant times of the year, such as fish migration or breeding, using the Drought Level 3 condition may significantly underestimate the impacts on aquatic species. At the very least, the lack of this vital information makes summary adjudication inappropriate.

Third, the DEIS does not deal with maximum cumulative withdrawal, but only analyzes normal and combined normal withdrawal. DEIS at 7-4, Table 7-1. If maximum cumulative withdrawals are analyzed, the percent of river withdrawn will be greater than what is disclosed Table 7-1. Combined maximum withdrawals under Drought Level 4 conditions will withdraw betwee 7.04 and 7.89 percent of the total river flow. Sulkin Affidavit ¶ 15-19. This is significant because the NRC Staff bases its conclusion on the incorrect belief that withdrawal will be less than 5 percent. DEIS at 7-5, *see* Sulkin Affidavit ¶ 21. The NRC Staff now acknowledges that the DEIS fails to analyze maximum combined flows, explaining that Plant Vogtle will actually

withdraw 6.7 percent of the river at Drought Level 3, not 5 percent. NRC's Answer to SNC's Motion for Summary Disposition at 12-13. These greater water withdrawal percentages will have significant impacts to aquatic resources. Young Affidavit ¶ 23-24. However, SNC maintains that Table 7-1 "provides maximum withdrawal rates for Units 1 and 2" SNC Statement of Undisputed Facts, ¶ 14.

Using the true maximum cumulative withdrawal data increases impacts. The thermal discharge's impact on aquatic species will be greater when using the correct low flow maximum withdrawal data. At a Drought Level 4, and maximum withdrawal, the size of the thermal plume will be larger than described in the DEIS. Sulkin Affidavit ¶ 25. The true increase is not know, because this data was not analyzed by the NRC Staff. Using the correct maximum withdrawal data also increases the estimated consumptive use of Plant Vogtle. At maximum cumulative withdrawal, Plant Vogtle will consume 4 percent of the river. Sulkin Affidavit ¶ 20. This is significant because the DEIS describes consumption under 3.5 percent as the threshold to base a conclusion of small impacts. DEIS at 5-2, 7-4. The DEIS claims that at most, only 3.4 percent of the river will be consumed, and concludes that impacts will be small because consumption is under 3.5 percent,. DEIS at 7-4, 7-5.

Fourth, the DEIS does not address cumulative impacts adequately. The DEIS employs the term "cumulative" to refer only to Units 1, 2, 3, and 4. It does not take into account significant withdrawals in the immediate vicinity of Plant Vogtle, such as the D-Area Powerhouse and the Savannah River Site. Sulkin Affidavit ¶ 22. It also does not take into account any withdrawals upstream of Plant Vogtle, such as the Urguhart Statuion, the Augusta Canal, the International Paper Mill at Augusta, or the City of Augusta. Sulkin Affidavit ¶ 23. The DEIS does not take into account known future increases of withdrawals upstream from the

Stevens Creek reservoir, which has recently applied to quadruple it withdrawal. Sulkin Affidavit ¶ 24. Thus, the cumulative impacts of proposed Units 3 and 4, combined with all present and foreseeable future withdrawals, is much greater than stated in the DEIS.

C. Environmental Contention 1.2 Is Not A Contention Of Omission, Has Not Been Properly Analyzed, And Is Therefore Not Moot

Environmental Contentions 1.2 is not a contention of omission, and because it has not yet been adequately addressed, it cannot be considered moot. A contention of omission is one that "alleges the omission of particular information or an issue from an application." *In the Matter of Duke Energy Corp.*, CLI-02-08, 56 N.R.C. 373, 383 (2002). If the information claimed lacking in the contention is later supplied, the contention is considered moot. *Id.* The claim of that the impact of chemicals on aquatic life was not properly addressed in the ER has subsequently been addressed in the DEIS. *See* Petitioner's Brief at 12. This was a contention of omission, and since it has now been addressed, it is moot. Unlike the chemical analysis, the remaining issues are not contentions of omission.

Intervenors did not move to amend this contention because it does not contain new claims; the contention alleges that NRC must *adequately* address the impacts described. The DEIS has not remedied any of the deficiencies identified in the ER prepared by SNC. A contention with no new claims "would not necessarily require a late-filed revision or substitution to constitute a litigable issue statement relative to the substance of the Staff's DEIS analysis of the same matter." *Duke Energy*, 53 N.R.C. at 389, FN 44. When no new claims are raised, a contention challenging an ER is also a challenge to the NRC Staff's subsequent DEIS. *Duke Energy*, 53 N.R.C. at 382. Amended contentions were not required in this case because these are not contentions of omission; the proper discussion is not *missing*, it is *inadequate*. This contention is based on SNC's failure in their analyze impacts in a meaningful way in the ER.

The DEIS purports to address these issues, but merely replicates the same problems as the ER: impacts are not analyzed in a proper or meaningful way. Because EC 1.2 has not been addressed, it is not moot.

EC 1.2 stated that "[t]he ER fails to identify and consider direct, indirect, and cumulative impacts of the proposed cooling system intake and discharge structures on aquatic resources." ASLB's Memorandum and Order: Ruling on Standing and Contentions, LBP-07-03, March 12 2007, at 17. When the scope of an admitted contention is in question, the Board must look to the bases discussed in support of the contention. *Duke Energy*, 56 N.R.C. at 379. The reasons stated by the Board for admitting this contention are that it contained "specific references to a number of alleged errors in the ER." ASLB's Memorandum, LBP-07-03 at 17. The Board also noted that the litigation of this contention "may involve the *question of the adequacy of the baseline information* provided by SNC relative to the portion of the Savannah River that encompasses the project area associated with the intake/discharge structures for both the existing and proposed Vogtle facilities." *Id.* at 18 (emphasis added). The DEIS does not address the errors of the ER, nor does it answer the question of the adequacy of the baseline conditions at Plant Vogtle.

III. CONCLUSION

For the foregoing reasons, the ASLB should dismiss SNC's Motion for Summary Disposition.

Respectfully submitted this 13th day of November, 2007,

[Original signed by L. Sanders]

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
SOUTHERN NUCLEAR OPERATING COMPANY	)	Docket No. 52-011-ESP
	)	
	)	
(Early Site Permit for the Vogtle ESP Site)	)	

CERTIFICATE OF SERVICE

I hereby certify that copies of the foregoing **JOINT INTERVENORS ANSWER OPPOSING SOUTHERN NUCLEAR OPERATING CO.'S MOTION FOR SUMMARY DISPOSITION OF ENVIRONMENTAL CONTENTION 1.2** have been served upon the following persons by Electronic Information Exchange and/or electronic mail.

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Dated this 13th day of November, 2007

[Original signed by L. Sanders]

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Lawrence D. Sanders

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket No. 52-011-ESP
SOUTHERN NUCLEAR COMPANY	)	
	)	ASLBP No. 07-850-01-ESP-BD01
(Early Site Permit for Plant Vogtle Site)	)	
	)	

AFFIDAVIT OF SHAWN PAUL YOUNG, PH.D.

I, Shawn Paul Young, do hereby declare under penalty of perjury:

Background

1. My name is Shawn Paul Young, Ph.D. I am currently Visiting Assistant Professor of Fisheries Biology at Purdue University, West Lafayette, Indiana. I also hold Adjunct Faculty status at Clemson University, Clemson, South Carolina. My current business address is 195 Marsteller Street, Forestry Building 102A, West Lafayette, Indiana 47907. I submit this affidavit as a private consultant to the Intervenors in this matter.

2. My professional and educational experience is summarized in the updated curriculum vitae attached to this affidavit. I received a B.S. in Environmental Studies from Northland College; a M.S. in Aquaculture, Fisheries, and Wildlife Biology from Clemson University; and a Ph.D. in Fisheries and Wildlife Sciences from Clemson University. I have eleven years of experience researching the effects of human activities on fisheries and aquatic ecosystems, including six years of experience studying fisheries in the Savannah River Basin. In addition to my professional qualifications, I have been an avid outdoorsman, fishing, hunting, and enjoying nature in every manner since my early childhood.

3. I have published 15 peer-reviewed articles relevant to fisheries and aquatic ecology. I have been consulted by public, state, federal, and academic sectors in the subject area of fish and aquatic ecology. I have presented scientific presentations at numerous professional meetings, academic seminars, and citizen fishing association functions.

4. I am familiar with the application of Southern Nuclear Operating Company ("Applicant" or "SNC") for an Early Site Permit ("ESP") at the Vogtle Electric Generating Plant site; SNC's Environmental Review ("ER"), the Draft Environmental Impact Statement ("DEIS") prepared by the NRC Staff; and the Joint Affidavit of NRC Staff, Christopher B. Cook and Rebekah H. Krieg, supporting SNC's motion for summary disposition. I have reviewed materials and data provided within the ER, DEIS and Joint Affidavit describing the additional two units' water intake, water consumption, and thermal discharge into the Savannah River, and subsequent potential impacts on the fish assemblage of the Savannah River.

5. I am providing this affidavit in support of Intervenors' Contention EC 1.2 -- Impacts on Fishery Resources of the Savannah River. The opinions and conclusions I express in this affidavit are my own and should not be attributed to Purdue or Clemson Universities. This affidavit explains my scientific opinion that the DEIS, information cited therein, and Joint Affidavit do not provide adequate data or analysis to properly evaluate potential effects of the proposed additional reactor units at Plant Vogtle on fishery resources of the Savannah River. I have extrapolated my knowledge and experience in this subject matter to the scenarios and data explained and detailed in the ESP application, ER, DEIS, and supporting documentation. I have arrived at my conclusions dealing with the matters stated herein and believe them to be true and correct.

6. The bases for Contention EC 1.2, discussed in my previous affidavit, remain. SNC either does not or cannot provide a detailed data set of Savannah River fish (1) life history stages that occur near Plant Vogtle, (2) respective migration timing of each species' life history, (3) distribution patterns in the immediate vicinity of Plant Vogtle and (4) population numbers. These data could be compared with numbers and species found within the intake canals and in the thermal discharge plume if such studies were ever conducted. Without this knowledge, analysis and modeling used to support NRC Staff conclusion that impacts due to entrainment, impingement, and thermal discharge will be small are still not appropriate or scientifically substantiated.

7. The motion for summary disposition of EC 1.2 (Page 4) claims that the DEIS cured deficiencies in three major aspects with respect to impingement and entrainment discussed in my previous affidavit and Intervenor's contention. In fact, the DEIS and NRC Staff affidavit do not cure any deficiencies from the ER. There remains no actual data presented, or studies conducted to acquire data, for entrainment at the existing Units 1 and 2. The only scientifically valid means of evaluating the impact of the existing units is through data collection. Likewise, field study of the existing units is the best indicator of likely impacts associated with additional units.

8. The DEIS and NRC Staff Affidavit incorrectly state that Table 2-7 provides a "comprehensive discussion of the Savannah River Fish Assemblage." Table 2-7 omits detailed fish species' life history stage information, which is absolutely crucial to determine true impacts due to entrainment and thermal discharge at Plant Vogtle. (DEIS at 2-76 - 2-83, 5-23 – 5-26). The information in the DEIS remains no more than a general list of fish species found in the Savannah River, with absolutely no detail concerning which species' life history stages are

present in the immediate vicinity of Plant Vogtle, and when. Nor does the DEIS include data concerning species abundance or distribution.

9. Data for early life history of fish that inhabit the Savannah River near Plant Vogtle, or pass by Plant Vogtle as part of the community drift, is of paramount importance in determining current and future impacts. The early life history stages of fish are the most susceptible to entrainment and thermal discharge because fish eggs have no mobility and larval fish have a very limited capacity for small-scale movement. Many fish species' eggs and larvae are found in the river drift because many larval fish are not capable swimmers and do not have the capacity for avoidance, large-scale movement or excessive activity that would increase energy expenditure. Therefore, many larval fish utilize the inertia of flowing water for passive transport to save energy. Their capability to exhibit avoidance is usually on a very small-scale in time and space; thus, their inherent vulnerability to entrainment. Further, fish eggs have no capacity for movement; thus, fish eggs have no ability to avoid entrainment or thermal discharge.

10. The DEIS acknowledges the drift community is important to analyze (DEIS at 5-23); yet, the NRC Staff downplays the susceptibility of egg and larval fish to water withdrawal and thermal discharge by erroneously stating, "Larval fish are capable swimmers and appear to avoid high flow rates." Joint Affidavit ¶15. As mentioned previously, larval fish are generally not capable swimmers and do not have the capacity to avoid high flow rates. At best, the Staff's claim is a gross over-generalization. Some species' larval stage may be more capable swimmers than others, but it is incorrect to assume that larval fish in the Savannah River are capable of avoiding impacts of the existing or proposed units.

11. As discussed in DEIS 5-23 – 5-26, design through-screen velocity is 0.5 ft/sec, which is equivalent to 6 inches/sec. However, literature cited at DEIS 2-83 indicates that larval

robust redhorse, identified as an "important" species in the DEIS, are capable of swimming at speeds of 3-5 inches/sec, which is insufficient to avoid the predicted water intake velocities (6 inches/sec). Again, this is contrary to the NRC Staff's claim that larval fish are capable swimmers and should be able to avoid entrainment.

12. As a rationale for the conclusion that impacts will be small, the NRC Staff states that, "fish and shellfish inhabiting a lotic environment (such as those species identified and listed in Table 2.7 of the DEIS) are adapted to survival in varying flow regimes and velocities." Joint Affidavit ¶ 16. Fish and shellfish can adapt to natural variability; but not human-induced variability. In this context, variability should be considered human-induced. Thus, the Staff statement contradicts the current knowledge that human-induced variation of flow regimes and velocities combined with increased entrainment mortality caused by operation of facilities such as Plant Vogtle (Marcy et al. 2005) are the primary causes for the decline of freshwater biodiversity (fish, mollusks, macroinvertebrates) in the United States (Masters 1990; Lazyer et al. 1993; Williams et al.1993; Vaughn and Taylor 1999; Ricardi and Rasmussen 1996; Cosgrove and Hastie 2001; Eversole 2001; Layzer and Scott 2006). Also, human-induced variation may decouple freshwater mussels from adult fish hosts needed for their parasitic-glochidial life history stage to be successful. Without an adult fish host during this period of life, death of the individual and reproductive failure of the population will occur.

13. The DEIS and NRC Staff Affidavit continually reference reports from studies conducted by the Academy of Natural Sciences, Philadelphia (ANSP 2001; 2003). The ANSP reports, however, contain none of the detailed information discussed above in paragraphs 6-8, such as fish species' abundance or distribution, including early life history stages, migration timing, or population numbers for fish in the immediate vicinity of Plant Vogtle. Notably, no

such studies have been conducted since the mid-1990's (ANSP 2001; ANSP 2003). Even then, several aspects of the ANSP research, including ichthyoplankton surveys, were performed on a limited basis only a few times per year, during alternating years. The DEIS and NRC Staff affidavit rely on portions of ANSP's research (2001 and 2003) that conducted fish investigations once per year, over 3 days during the month of September, at a limited number of sampling stations. This sampling protocol is grossly insufficient to supply information needed to draw appropriate conclusions regarding the impact of the proposed Units 3 and 4 on fish species.

14. Applicants also state that impingement/entrainment have been very small at Plant Vogtle. This is based on SNC staff's general observation by cleaning trash baskets 2-3 times per year. Anecdotal evidence gathered during another activity that does not account for scientific controls is a grossly inadequate method for analyzing impingement/entrainment from water withdrawal. Similarly, the single observation during the March 8, 2007 site visit is insufficient to make a definitive conclusion regarding impacts from impingement.

15. At minimum, a study of current entrainment and impingement associated with the existing intake structure is necessary to determine the current baseline impacts, as well as cumulative impacts of adding two new reactors. Previous studies of the effects of the existing intake structure were conducted 20 – 30 years ago. The assumptions made in previous modeling of entrainment at intakes for existing units, discussed in NRC 1985, are improper and misleading. Without actual field study of the existing intake it is not possible to confidently determine the level of impacts. Without such study, it is likewise inappropriate to conclude that the proposed units will have insignificant impacts.

16. Seasonal field studies are needed to determine current ichthyoplankton species composition, distribution, and vulnerability to entrainment at the existing intake structures.

Ichthyoplankton-net collections are a standard technique in early life history studies of fish (Bilkovic et al. 2002; Overton and Rulifson 2007; Perez-Ruzafa 2007). Ichthyoplankton collections should be conducted at equal intervals from riverbank to riverbank, surface to bottom, during a stratified sampling period occurring day and night several times per week during each month of the year to fully understand the composition of the drift community in the Savannah River near Plant Vogtle water intake structures and thermal discharge plume. This sampling in combination with coinciding ichthyoplankton netting within the intake canal and thermal plume could determine percent of drift community entrained by water withdrawal or affected by thermal discharge for existing units.

17. Furthermore, the aquatic surveys that have been conducted and reported in the DEIS are inadequate for the purpose of assessing the impact of proposed Units 3 and 4. The only surveys conducted in the immediate vicinity of Plant Vogtle discussed in the DEIS were conducted by ANSP to separate the impacts of Plant Vogtle impacts from the DOE Savannah River Site (ANSP 2003). From 1985 through 1996, ANSP sampled near Plant Vogtle approximately every 2 years. Beginning in 1997, sampling at the Plant Vogtle stations was limited to diatom surveys only (ANSP 2003). The ANSP studies were not intended or designed to be a systematic evaluation of the impacts of Plant Vogtle, as they are being used in the DEIS. The ANSP studies provide some useful data, but do not by themselves support a conclusion that the addition of two new units will have only small impacts on aquatic resources.

18. Recent ANSP surveys fail to consider the small benthic, planktonic and nektonic (organisms in the water column) forms, including early life stages of fish and shellfish, which make up the aquatic community of the Savannah River. Diatoms, studied by ANSP, have greater tolerances, are species generalists, and can live in a wide variety of environmental conditions

(Pither and Aarseen 2005). Thus diatoms are not good sensitive indicator species for evaluating the current health of the river, in terms of species abundance and diversity; nor are they an appropriate indicator of potential impacts of adding two new units at Plant Vogtle. Surveying for diatoms would not likely reveal problems with the water or aquatic ecology of the area until a severe problem in the environment occurs. In other words, diatom surveys have limited utility for estimating impacts associated with the Plant Vogtle intake and discharge systems.

19. The NRC Staff cites ANSP (2001; 2003) in support of the conclusion that existing Plant Vogtle operations have not affected Savannah River fish. (DEIS at 7-16). However, Marcy et al. (2005), identify Plant Vogtle as among the human activities negatively affecting Savannah River fish by reducing species diversity and population levels. All the authors of Marcy et al. (2005) are reputable fish and aquatic ecologists with many years of study focused on the middle Savannah River basin (MSRB). Marcy et al. (2005, P. 16) state,

> "Use of river water for industrial purposes, such as cooling water, has affected MSRB fish populations through entrainment (in which fish eggs and larvae are caught up in the current of a water intake device) and impingement (the removal of juvenile and adult fish from the intake stream by means of a small-mesh [0.95 cm] screen). Entrainment occurs wherever large volumes of water are removed, such as at domestic water treatment plants, or used in industrial processes. Mortality due to entrainment varies according to the species of fish, its life stage, and physical parameters of water flow such as current speed and turbulence. Changes in temperature or other water quality parameters and amelioration devices such as traveling screens that return the entrained animal to the water away from the from the intake device also plays a role in survival. See Schubel and Marcy 1978 for biological assessment of entrainment impacts. Historically, the largest sources of entrainment in the MSRB have been the reactor cooling water intakes for the SRS (9.8% of Savannah River flow) and the Plant Vogtle nuclear power station (4.2% of river flow; Wiltz 1981; DOE 1990)."

20. The DEIS assumes that proposed Units 3 and 4 will have similar levels of entrainment as existing Units 1 and 2, but acknowledges that entrainment studies have not been conducted for the existing units. (DEIS at 5-25). The Final Environmental Impact Statement for

Units 1 and 2 (NRC 1985) assumed a uniform drift community and, therefore, entrainment would be equal to the proportion of river discharge withdrawn by the intake structure. The NRC Staff estimated 1 to 3.5 percent removal because the cooling water intake withdraws between 1 and 4 percent of the total river flow. Extrapolating the level of entrainment from the percentage of river discharge is not a scientifically accepted approach to evaluating impacts of cooling water intake structures.

21. The NRC Staff extrapolation is inherently unreliable because the drift community is not uniformly distributed. The NRC Staff analysis and conclusions disregard the data collected during pre-operation monitoring of the Plant Vogtle site. Wiltz (1983) studied fish egg and larval fish drift, and Nichols (1983) surveyed macroinvertebrate drift distribution near Plant Vogtle during pre-operation monitoring. Both found that the drift community, including eggs and larvae of 34 fish species, were non-uniformly distributed and varied over time and space in the vicinity of Plant Vogtle. Eggs and larvae of several fish species that were collected in the drift near Plant Vogtle (Wiltz 1983) are identified in the ER or DEIS as species that would not be found in the drift community because they are demersal spawners, endobenthic dwellers, or stream fish. These included sturgeon, suckers, American shad, and Savannah darter. Wiltz (1983) found American shad eggs increased in number and constituted 45% of the drift community during the month of May, and that larval suckers constituted as much as 37.5% of the drift in May. This exhibits highly concentrated egg and larval drift at peak periods. During periods of increased abundance and concentrated drift, entrainment will not correlate directly with the percent of flow withdrawn and there exists a potential for much larger impacts.

22. The DEIS (2-83) only contains facts about robust redhorse that are favorable to a finding of insignificant impacts and disregards data leading to an opposite conclusion. For

example, the DEIS presumes that the suckers like the robust redhorse spawn in the gravel and therefore, they are not part of the drift community susceptible to entrainment or thermal discharge. This logic is contradicted by field data from Wiltz (1983), where larval suckers comprised a large part of the larval fish drift community. Wiltz found mainly spotted sucker larvae, which exhibit the same spawning strategy and use the same gravel bars as robust redhorse. (Grabowski and Isely 2006). Thus, it is likely that if larval spotted suckers comprise part of the drift, robust redhorse larvae also comprise part of the drift even though they spawn in gravel. The DEIS fails to make this basic connection and downplays the level of potential impacts.

23. Even if it were appropriate to extrapolate the level of impacts from the percentage of the total river flow being withdrawn or discharged, the DEIS incorrectly concludes that the proposed units, alone or in combination with the existing units, will have insignificant impacts. According to the DEIS, "the EPA determined that limiting withdrawal to 5 percent of the source water body mean flow was technically achievable and economically practicable and that larger withdrawals may result in greater level of entrainment." (DEIS 5-24). Notable, the EPA does not claim that withdrawals of less than 5 percent result in insignificant impacts on aquatic resources; only that it is possible to reduce withdrawals to 5 percent, and that larger withdrawals will result in greater impacts. I am unaware of any scientific basis to state categorically that taking up to 5 percent of the drift community will have minor or insignificant impacts.

24. Fish typically experience high natural mortality, and exhibit high fecundity to counterbalance natural losses, such as predation. However, it does not follow that human-induced mortality of 1 to 3.5 percent associated with proposed Units 3 and 4 will be minor or insignificant. (DEIS at 5-25). While fish populations are adapted to survive high natural

mortality rates, they are easily overwhelmed by human-induced changes in the environment. Several species of Savannah River fish, such as the shortnose sturgeon and robust redhorse, have experienced population declines leading to a threat of extinction locally. Clearly, high natural fecundity has not resulted in healthy, stable populations in the face of human-induced impacts to their environment. In my opinion, entrainment losses of 1 to 3.5 percent assumed in the DEIS, could have significant negative impacts on sturgeon and redhorse.

25. The DEIS relies on the estimate in the Final EIS (NRC 1985) for Units 1 and 2 to estimate the potential entrainment losses from the proposed units. (DEIS at 5-25). In that EIS, the "NRC determined that a 1 to 3.5 percent removal proportion would have insignificant effect on the drift organisms, aquatic community, and resident fish in the vicinity of VEGP Units 1 and 2." (Id.). As discussed above, in my opinion, this conclusion is not supported by accepted scientific methodology. Even if it were correct that withdrawing less than 5 percent of the total Savannah River discharge would have an insignificant impact, it is clear that proposed Units 3 and 4, combined with the existing Units 1 and 2, will withdraw more than 5 percent of river discharge. The DEIS estimates that entrainment from Units 3 and 4 will be similar to Units 1 and 2. (Id.). Thus the total entrainment rate for all four units will be 2 to 7 percent, not "less than 5 percent" as reported in the cumulative impacts analysis of the DEIS. (DEIS 7-4). The NRC Staff currently predicts the maximum combined withdrawal will "fluctuate between 2.9 and 6.7 percent of the total flow of the Savannah River as the river discharge fluctuates between average and Drought Level 3 flows." Joint Affidavit at ¶11. So, even using the faulty methodology employed by the NRC Staff, the combined withdrawal from all four units will exceed the 5 percent significance threshold set forth in the DEIS.

26. I also note that the calculation of withdrawal as a percentage of flow (used to estimate impacts as a proxy for actual field observation and data collection) is based on an assumed minimum flow of 3,800 cfs. The DEIS does not address the potential impacts associated with lower flows, even though they are reasonably likely to occur. Using the same data relied upon by SNC and the NRC Staff, Intervenors' expert, Barry Sulkin, calculated the percentage withdrawn under observed low-flow conditions at the USGS Jackson gage (3,220 cfs). Sulkin Affidavit ¶ 19. Under these flow conditions, Units 3 and 4 will withdraw between 2.6 and 4.0 percent of the total river discharge, and the maximum combined withdrawal for all four units will be 7.9 percent. Id. Again, the evidence indicates that impacts will exceed the 5 percent significance threshold set forth in the DEIS.

27. Combined maximum withdrawal of all four units under observed low-flow conditions will approach 8 percent of the total flow of the Savannah River. Assuming a non-random drift distribution with distribution concentrated near the intake structures could result in significantly higher entrainment rate. Those entrainment rates may peak at certain times of the year, coinciding with peak egg and larval fish abundance of species, such as American shad and suckers as stated in Wiltz (1983). During spring and summer when eggs and larvae of anadromous and resident species are in peak abundance, if river conditions create a situation where a high proportion of ichthyoplankton are near intake structures those species, such as American shad, could be disproportionately impacted. Also, if entrainment of macroinvertebrates is disproportionately high during the periods of high larval fish abundance, larval and juvenile fish may experience increased mortality due to starvation, as macroinvertebrates may comprise much of young fishes' diets.

28. The DEIS also fails to account for the cumulative impacts of the proposed units combined with other withdrawals occurring in the Savannah River. The Savannah River Site is located directly across the river from Plant Vogtle and also withdraws significant amounts of water. Mr. Sulkin calculates the combined low-flow withdrawal from SRS and the four Plant Vogtle units will be as much as 10.2 percent of the total Savannah River flow—more than double the 5 percent level of significance identified in the DEIS. Other withdrawals upstream and downstream of Plant Vogtle also contribute to the cumulative impacts on aquatic species of the Savannah River. The DEIS makes no effort to estimate the cumulative impacts of the proposed new units when combined with all other existing withdrawals. In my opinion, withdrawal of approximately 10 percent of the Savannah River flow in the vicinity of Plant Vogtle and the Savannah River Site may have significant detrimental effects to aquatic resources.

29. DEIS and Joint Affidavit (p. 15 #16) downplays the importance of aquatic habitat near Plant Vogtle by describing it as "unremarkable." It is disingenuous to say "unremarkable" when DEIS at 2-79 states that "A number of important species of fish occur within the Savannah River. These include commercially and recreationally important species and species listed by the states of South Carolina and Georgia as threatened and endangered, or species of concern." All aspects of a river are remarkable in terms of the intricate balance and complexity of all its parts to support fish and other organisms. The portion of the Savannah River in the vicinity of Plant Vogtle is an important part of the river continuum. That is every part of the Savannah River is of importance for the various organisms' survival by providing habitats needed at different life history stages that must match available food and habitats in time and space. Passive transport as part of river drift community is a major component to ensuring that adequate food and the

appropriate habitats are found to ensure survival of fish populations. Increased withdrawal and thermal discharge at various river flows may have large impacts due to these ecological characteristics of fish. SNC staff fails to appreciate and adequately incorporate these principles into their conclusions. This coupled with the lack of data pertaining to the drift community near Plant Vogtle provides evidence that SNC staff conclusions are not substantiated, and impacts have the potential to be much greater than anticipated.

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

Date:__11-13-07_____

(Original signed by Shawn Paul Young)
Shawn Paul Young, Ph.D.
2480 West State Road 26
West Lafayette, IN 47906

SWORN AND SUBSCRIBED BEFORE ME on this _13__ day of November, 2007

(Original signed by Sondra S. Exmeyer)
Notary Public

MY COMMISSION EXPIRES:

(Original stamped by Sondra S. Exmeyer)

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November 9, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket No. 52-011-ESP
SOUTHERN NUCLEAR COMPANY	)	
	)	ASLBP No. 07-850-01-ESP-BD01
(Early Site Permit for Plant Vogtle Site)	)	
	)	

AFFIDAVIT OF BARRY W. SULKIN

County of Davidson)
)
State of Tennessee)

I, Barry W. Sulkin, declare as follows:

1. I am a citizen and resident of Davidson County, Tennessee, living at 4443 Pecan Valley Road, Nashville, Tennessee 37218. I am an environmental consultant and have been hired by the intervenors in this matter. This declaration is based on my personal knowledge, experience, and training and a review of documents related to this matter. My curriculum vitae is attached.

2. I received my Bachelor of Arts in Environmental Science in 1975 from the University of Virginia, where I received a Du Pont Scholarship. I received my Masters of Science in Environmental Engineering in 1987 from Vanderbilt University, as described below. My areas of study included chemistry, biology, limnology and hydrology of streams and lakes, including thermal pollution.

3. In 1976 I joined the staff of what is now called the Tennessee Department of

Environment and Conservation (TDEC) as a Water Quality Specialist, and continued to work for this agency for almost 14 years. I worked in the Chattanooga, Knoxville, and Nashville field offices and the central office of what is now called the Division of Water Pollution Control. I received on the job training in addition to formal education, in areas such as stream assessment. My duties included inspections and enforcement coordination for the water pollution programs, as well as work with the drinking water, dam safety, underground storage tank, and solid/hazardous waste programs. I also conducted investigations regarding fish kills, spills, and general complaints, including problems involving stream alterations and relocations. I was also involved in developing, implementing, and enforcing the state's Aquatic Resource Alteration Permit (ARAP) program, as well as activities related to the Corps of Engineers 404 permit program and the state's 401 certification component.

4. In 1985 I became State-wide manager of the Enforcement and Compliance Section for the Division of Water Pollution Control. In this capacity I was responsible for investigating and preparing enforcement cases, supervising the inspection programs and permit compliance monitoring, and special projects and field studies including water quality and assimilative capacity and permit modeling. While in this position I took an educational leave to obtain my Masters of Science in Environmental Engineering in 1987 from Vanderbilt University. I returned to my position as manager of the Enforcement and Compliance Section in 1987, where I remained until 1990.

5. Since 1990, I have engaged in a private consulting practice specializing in water quality problems and solutions, regulatory assistance, NPDES permits, stream surveys, and various environmental investigations related to water. I have worked for

many private clients over the past 17 years where I have been required to interact with state and federal environmental agencies. I have researched the matters for which I give opinion in this declaration.

6. I am familiar with the application of Southern Nuclear Company for an Early Site Permit (ESP) at the VEGP site. I have reviewed excerpts of the Environmental Report included with Southern's ESP Application, the NRC's Draft EIS, Southern's Motion for Summary Disposition, and related documents submitted in this matter.

7. The DEIS relies on estimates of the Savannah River flow at the Plant Vogtle site as the basis for calculating impacts associated with the cooling water intake system and waste discharge system. Table 5-1 the DEIS shows the magnitude of surface water withdrawals associated with proposed Units 3 and 4, as a percentage of river flow, under average and drought conditions. (DEIS at 5-7). To calculate the size of heated effluent discharge plume, the DEIS reports the results of CORMIX computer modeling at average and low-flow conditions. (DEIS at 5-13 – 5-16). The DEIS concludes that impacts to aquatic species due to entrainment will be minor in part because only a small percent of the total Savannah River flow will be withdrawn by the cooling water intake structure. (DEIS at 5-23 – 5-25). The DEIS also utilizes flow conditions as a basis for rejecting once-through and dry cooling system alternatives. (DEIS at 9-25 – 9-26). Thus, if the flow data used in the DEIS are inaccurate, then the conclusions regarding the magnitude of impacts associated with operation of proposed Units 3 and 4 are invalid.

8. The USGS collects Savannah River flow data from several locations upstream and downstream of the Plant Vogtle site. Gage number USGS 021973269, Savannah

River near Waynesboro, is located at the Plant Vogtle site. Unfortunately, the Waynesboro gage has only been operational since January of 2005 and does not have a sufficiently long period-of-record to support statistical analysis of the flows likely to occur at the Vogtle site. (http://waterdata.usgs.gov/nwis/nwisman/?site_no=021973269&agency_cd=USGS)

9. USGS flow gage 02197320, Savannah River near Jackson, SC, was located approximately 6 miles upstream of the Plant Vogtle site. The Jackson gage was activated in October 1971 and discontinued in September 2002. During this 31-year period-of-record, the minimum recorded Savannah River discharge was 3220 cfs, on December 9, 1981. The NRC Staff used the period-of-record discharge dataset to calculate the average-daily discharge, which is reported in the DEIS as 8830 cfs. The NRC Staff did not calculate the 7Q10 flow using the Jackson gage dataset. The DEIS uses the average-daily discharge at the Jackson gage, 8830 cfs, as the basis for determining average-water-level impacts associated with proposed Units 3 and 4 intake and discharge systems. (*See* DEIS at 2-19). However, the DEIS does not utilize the minimum recorded flow at the Jackson gage to estimate the low-flow impacts of the proposed units.

10. USGS flow gage 219700, Savannah River near Augusta, is approximately 49 miles upstream of the Plant Vogtle site. In the ER, Southern reports the 7Q10 flow at Augusta for the period between April 1986 and March 2003 (8 years). (ER at 2.3.1-6). The 7Q10 calculated by Southern is 3,828 cfs. (*Id.*). Neither the ER nor the DEIS reports the minimum recorded Savannah River discharge at Augusta. However, ER Table 2.3.1-15 indicates the minimum flow (recurrence interval of 100%) between 1986 and 2003 was 3,369 cfs. (ER at 2.3.1-54). The ER utilizes the 7Q10 flow at Augusta for

1986-2003 (3,828 cfs) as the basis for estimating the low-flow impacts associated with proposed Units 3 and 4 intake and discharge systems.

11. The NRC Staff estimate of low-flow impacts of proposed Units 3 and 4 is based upon the release of water from J. Strom Thurmond Dam, approximately 71 miles upstream from the Plant Vogtle site. According to the DEIS, "the average discharge passing the VGEP site is directly proportional to the average quantity of flow released from J. Strom Thurmond Dam. (DEIS at 2-19). It may be that the river discharge is proportional to the release from Thurmond Dam, but it is incorrect to assume that the flow at the Vogtle site will equal the release from the reservoir. The DEIS fails to account for municipal and industrial withdrawals and discharges, or the natural accretion of flow, occurring in the 71 river miles between Thurmond Dam and the Vogtle site. The DEIS provides no reasoned basis to assume a one-to-one correlation between the release from Thurmond Dam and the river discharge at the Vogtle site.

12. It is extremely unlikely that flows at the Plant Vogtle site will be equal to the release from Thurmond Dam over the entire range of flows, as assumed by the NRC staff in the DEIS. In the absence of any surface water withdrawals or discharges, the flow at Plant Vogtle would be greater than the release from Thurmond Dam because the river drains a significantly larger area 71 miles downstream. In addition to this natural accretion, there are numerous withdrawals and discharges between Thurmond Dam and the Vogtle site.

13. The DEIS is inconsistent in its use of flow data. As mentioned previously, the DEIS estimates impacts of proposed Units 3 and 4 under average conditions with the

average-daily discharge from the Jackson gage, but estimates low-flow impacts using the releases from Thurmond Dam.

14. Leaving aside natural accretion, withdrawals, and discharges, the DEIS utilizes releases from Thurmond Dam under the Drought Contingency Plan for the Savannah River Basin promulgated by the U.S. Army Corps of Engineers as the basis for estimating low-flow impacts of the proposed new intake and discharge systems. Table 2-2 summarizes the Drought Contingency Plan rule curves, which include four drought levels. (DEIS at 2-20). Drought levels are based on the total volume of water stored behind the Hartwell and Thurmond dams. Drought Levels 1-3 prescribe specific discharges from Thurmond Dam to the Savannah River. (USACE 2006, *Drought Contingency Plan Update: Savannah River Basin, Draft Environmental Assessment*). Drought Level 4—the most severe drought conditions—results in discharges from Thurmond Dam equal to the inflow from upstream. Thus, there is no mandated minimum flow prescription for Drought Level 4 under the Drought Contingency Plan.

15. The DEIS estimates low-flow impacts at Drought Levels 1 – 3, but entirely disregards Drought Level 4 conditions. Thus, the DEIS calculates the maximum withdrawal for Units 3 and 4 (129 cfs) as 3.4 percent of the Drought Level 3 discharge (3,800 cfs). (DEIS at 5-7). Similarly, the DEIS uses Drought Level 3 flows as the basis for estimating impacts to aquatic species. (DEIS at 5-24 – 5-30). Likewise, the DEIS calculates the cumulative withdrawals of the existing Units 1 and 2 and the proposed Units 3 and 4 as "finally reaching 4.6 percent when the river discharge has declined to Drought Level 3." (DEIS at 7-3). However, under Drought Level 4 conditions the

Savannah River discharge will decline further, resulting in a greater percentage of total flow being withdrawn.

16. According to the DEIS, the NRC Staff ignored Drought Level 4 conditions because "they cannot be calculated because the river discharge is not specified." (DEIS at 5-6, 7-3, 7-5). Notably, the DEIS does not contend that there is no reasonable likelihood that Drought Level 4 conditions will occur, or discuss the frequency and duration of such events. In addition, it is not correct that the likely river discharge under Drought Level 4 conditions cannot be calculated. Although there is no specific minimum flow mandate, it is standard practice to use computer models to predict river discharge based on the drought-of-record. Indeed, the Corps of Engineers apparently conducted such modeling in conjunction with adopting the current Drought Contingency Plan. (*See* USACE 2006, *Drought Contingency Plan Update: Savannah River Basin, Draft Environmental Assessment* at 1.) The NRC Staff should consult with the Corps of Engineers, obtain its Drought Level 4 model results, and analyze them in the context of the proposed withdrawal and discharge systems.

17. The DEIS derived dry-year flows from the Corps' draft Environmental Assessment for the *Drought Contingency Plan Update: Savannah River Basin*, which addresses changed in the original Savannah River Basin Drought Contingency Plan adopted in March 1989. According to the Environmental Assessment, "reservoir modeling was conducted to ensure that outflows at Thurmond Dam and flows at Augusta did not fall below 3,600 cfs." (USACE 2006, *Drought Contingency Plan Update: Savannah River Basin, Draft Environmental Assessment* at 1.). This statement suggests that the Drought Level 4 minimum flow is expected to be above 3,600 cfs; however, the

Environmental Assessment is ambiguous in this regard. Again, this ambiguity could be clarified through consultation with the Corps of Engineers.

18. Assuming a Drought Level 4 minimum discharge of 3,600 cfs, normal withdrawals of proposed Units 3 and 4 (83 cfs) will divert 2.3 percent of the total river volume, and maximum withdrawals (129 cfs) will divert 3.6 percent. The maximum expected withdrawal for Units 3 and 4, in addition to the maximum observed withdrawal from existing Units 1 and 2 (129 cfs.), would result in a cumulative maximum withdrawal of 254 cfs, or 7.06 percent of the total river discharge. These results do not account for withdrawals or discharges occurring between Thurmond Dam and Plant Vogtle.

19. Assuming that the minimum flow at the Jackson gage under Drought Level 4 will be no less than the historical low flow of 3,220 cfs, then Units 3 and 4 will withdraw between 2.6 and 4.0 percent of the total river discharge. The maximum cumulative withdrawal of all four Units combined (254 cfs) would be 7.89 percent of the total discharge. As discussed previously, the Drought Contingency plan does not prescribe a minimum flow. Therefore, it is reasonable to assume that the minimum observed flow at the Jackson gage is indicative of the likely future minimum discharge. This method of estimating the minimum flow at the Plant Vogtle site, using observed data from the closest gage, accounts for upstream withdrawals and discharges.

20. Consumptive use of water, as a percentage of total river discharge, also increases under Drought Level 4 conditions. At a minimum flow of 3,600 cfs and normal consumptive use (62 cfs), proposed units 3 and 4 will consume 1.7 percent of the total river discharge, which increases to 1.9 percent if we assume a minimum flow of 3,220 cfs. At a normal withdrawal rate of 129 cfs, all four units combined will consume 3.6

percent of the total river discharge at a flow of 3600 cfs, and will consume 4.0 percent of total river discharge at a flow of 3220 cfs. (*See* DEIS at 7-4, Table 7-2). Table 7-2 of the DEIS only describes percentage of river flow consumed based on normal withdrawal. Table 5-2 does discuss consumptive use of units 3 and 4 at maximum withdrawal (64 cfs). (DEIS at 5-8). Maximum combined percentages cannot be determined because the maximum consumptive use for units 1 and 2 is not listed in Table 5-2 or 7-2 of the DEIS. If the maximum consumptive use numbers from Table 5-2 are applied, the percentage of river flow consumed by units 3 and 4 increases. At a minimum flow of 3600 cfs and maximum withdrawal of 64 cfs, units 3 and 4 will consume 1.8 percent of the river. At the historical minimum flow of 3220 cfs and maximum withdrawal of 64 cfs, units 3 and 4 will consume 2.0 percent of the river.

21. On page 7-5 of the DEIS, the NRC staff concludes the combined withdrawal of all four units would be small, and therefore mitigation would be unwarranted. The staff bases this conclusion on the belief that "the total the VEGP site withdrawals are expected to be less than 5 percent of the total river discharge," and that "the total VEGP site consumptive use is expected to be less than 3.5 percent of the total river discharge." DEIS at 7-5. The NRC Staff concedes that combined maximum withdrawal at a Drought Level of 3 is 6.7 percent of the river, and, as discussed above in paragraphs 18 and 19, I estimate that combined maximum withdrawals at a Drought Level of 4 will be between 7.06 to 7.89 percent. Also, the combined normal consumptive use at a Drought Level of 4 will be between 3.6 and 4.0 percent of the river, not less than 3.5 as reported in the DEIS. The maximum consumptive use would be higher still.

22. The NRC Staff's use of the term "cumulative impacts" is misleading because it only takes into account the impacts of Units 1, 2, 3 and 4, and does not take into account all significant withdrawals within the immediate vicinity of VEGP. The Savannah River Site withdraws 4.5 cfs on average, while the D-Area Powerhouse withdraws 68.4 cfs on average. (DEIS at 2-33 - 2-34). The true cumulative withdrawal for the area of the river at which VEGP is located is the combination of the four units (maximum of 254 cfs) plus SRS and the D-Area Powerhouse. At Drought Level 4, the true cumulative impacts of withdrawals in this area of the river means that 9.1 percent of the river is used when the flow is 3600 cfs, and 10.2 percent of the river is used when the flow is at the historical low of 3220 cfs.

23. The term "cumulative impacts" also does not include any upstream withdrawals not within the immediate vicinity of VEGP. The Urquhart Station, located on the Savannah River upstream from VEGP, withdraws 127.5 cfs on average. (DEIS at 2-34). The Augusta Canal withdraws a maximum amount of 50 mgd (77.3 cfs). (Vogtle Early Site Permit Environmental Report at 2.3.2-10). The City of Augusta withdraws a maximum amount of 21 mgd (32.5 cfs). (*Id.*). The International Paper plant at Augusta Mill withdraws a maximum of 79 mgd (122.2 cfs). (*Id.*). These upstream withdrawals will affect the flow of the river at the VEGP site.

24. The NRC Staff also does not consider known future increases of withdrawals from the Savannah River. South Carolina Electric and Gas Company together with Columbia County Water and Sewage System has recently applied to Federal Energy Regulatory Commission to increase its withdrawals from the Stevens Creek Reservoir, fed by the Savannah River and located upstream from VEGP, from 10 mgd (15.5 cfs) to

47.1 mgd (72.8 cfs). (Application to Increase Amount of Withdrawal of Project Waters by Columbia County Water and Sewage System, FERC Project No. 2353 GA and SC, October 26 2007, at 1). The Augusta Canal currently requires a flow of between 3480 and 3656 cfs. It is projected that by 2035, the Canal will require flows of between 4307 to 4353 cfs. (Final Environmental Assessment for Hydropower License, Augusta Canal Project, P-11810-0004, September 2006 at 8, Table 2). The City of Augusta is also planning on increasing its water use. The Augusta-Richmond County Water System currently uses a maximum flow of 3,656 cfs. (*Id.* at 35). Augusta plans to upgrade its pumping systems, requiring an increase of withdrawal from 1221 cfs to 1628 cfs by the year 2015. Consumptive use will increase in that time from 45 cfs to 60 cfs. (*Id.* at 36).

25. The NRC Staff's conclusion that the impact of thermal discharge at VEGP would be small and localized is based on the same erroneous premise discussed above. (DEIS at 5-17). Thermal discharge would have its greatest impact when "river discharge is the lowest (and) the outfall discharge is the largest." (DEIS at 5-14). However, the DEIS addresses only the impact of the thermal discharge under Drought Level 3 conditions (3,800 cfs) instead of a Drought Level of 4 (under 3,600 cfs), when river discharge is truly at its lowest. (DEIS at 5-16). At a Drought Level of 4, the thermal plume is greater, and therefore the impact on the river is greater. Similarly, the cumulative impact of all four units' thermal discharge will be greater at Drought Level 4 rather than Drought Level 3. (*See* DEIS at 7-7). Without correct river discharge input to the CORMIX model, the predicted thermal output from the model is unreliable. Similarly, at lower flows the river is narrower and, thus the size of the thermal plume relative to the entire river also changes.

26. The DEIS also dismisses dry or hybrid wet/dry cooling systems because "the Staff found that the impacts of the proposed natural draft, wet tower system water use, water quality, and water resources would be SMALL." (DEIS at 9-26). As a result, the Staff concludes that a Wet cooling system is preferable to either dry or hybrid cooling system for Units 3 and 4. Again, this conclusion is based on the unreasonable assumptions about water withdrawals and Savannah river flows, especially during periods of maximum withdrawal and minimum flows.

I declare under the penalty of perjury that the foregoing is true and correct to the best of my knowledge, information, and belief.

Executed this 9th day of November, 2007.

Executed in Accord with 10 C.F.R. § 2.304(d)

_____
Barry W. Sulkin

SWORN AND SUBSCRIBED BEFORE ME on this 9th day of November, 2007

_____
Notary Public

My Commission expires: