October 29, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

NRC STAFF ANSWER TO SOUTHERN NUCLEAR OPERATING COMPANY'S MOTION FOR SUMMARY DISPOSITION OF ENVIRONMENTAL CONTENTION 1.2

INTRODUCTION

Pursuant to 10 C.F.R § 2.1205(b) and the May 7, 2007 Memorandum and Order (Prehearing Conference and Scheduling Order) of the Atomic Safety and Licensing Board ("Board"), the staff of the Nuclear Regulatory Commission ("NRC Staff" or "Staff") hereby responds to "Southern Nuclear Operating Company's Motion for Summary Disposition of Intervenors' Environmental Contention 1.2 (Cooling System Impacts on Aquatic Resources)," ("Southern EC 1.2 Motion") filed by Southern Nuclear Operating Company ("Southern" or "Applicant") on October 17, 2007. For the reasons set forth below and in the Joint Affidavit of Christopher B. Cook and Rebekah H. Krieg ("Cook/Krieg Aff."), the Staff submits that there does not exist a genuine dispute of material fact concerning Environmental Contention ("EC") 1.2 and that, based on these facts, the Applicant is entitled to a decision in its favor as a matter of law. Accordingly, the Applicant's Motion should be granted.

BACKGROUND

On August 15, 2006, Southern submitted an application pursuant to 10 C.F.R. Part 52, Subpart A, in which it requested an Early Site Permit ("ESP") for a site within the existing Vogtle Electric Generating Plant ("VEGP") site near Waynesboro, Georgia. On December 11, 2006, a

joint petition for leave to intervene was filed by the 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 (collectively, "Joint Intervenors"), and several contentions were filed concerning the Environmental Report ("ER") filed as part of the Application.

On March 12, 2007, the Board ruled on the admissibility of the Joint Intervenors' proffered contentions. *See Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-07-3, 65 NRC 237 (2006) (*"Vogtle ESP"*). The Board admitted two contentions, EC 1.2 and EC 1.3.[4] The subject of the instant motion, EC 1.2, as admitted, was restated by the Board 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.

Vogtle ESP, LBP-07-3, 65 NRC at 280.

In September 2007, the NRC Staff published the "Draft Environment Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site," NUREG-1872 ("DEIS").[5] In the DEIS, the NRC Staff addressed the impingement, entrainment, chemical, and thermal effluent discharge impacts of the proposed cooling system intake and discharge structures on aquatic resources. *See* DEIS Sections 5.4 (Operational Impacts) and 7.5 (Cumulative Impacts).

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[4] EC 1.3 is the subject of another Southern motion for summary disposition and as such the NRC Staff is providing a separate answer to that motion. *See* NRC Staff Answer to Southern Nuclear Operating Company's Motion for Summary Disposition of Environmental Contention 1.3 (Oct. 29, 2007).

[5] The DEIS was made available to the Board and the parties to this proceeding on September 10, 2007. *See* Letter from J.M.Rund, NRC Staff Counsel, to Administrative Judges (Sept. 10, 2007).

On October 17, 2007, Southern filed the instant Motion seeking summary disposition of Joint Intervenors' Contention EC 1.2.

DISCUSSION

I. Legal Standards

A. In a Subpart L proceeding, such as this one, the Board must apply the summary disposition standard set forth in Subpart G. *See* 10 C.F.R. § 2.1205(c). Under this standard, a motion for summary disposition should be granted "if the filings in the proceeding, depositions, answers 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 that the moving party is entitled to a decision as a matter of law." 10 C.F.R. § 2.710(d)(2).

The Commission's summary disposition procedures have been analogized to Rule 56 of the Federal Rules of Civil Procedure. *See Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), CLI-01-11, 53 NRC 370, 384 (2001); *Advanced Medical Systems, Inc.* (One Factory Row, Geneva, Ohio), CLI-93-22, 38 NRC 98, 102 (1993) (*"Advanced Medical"*). As such, the movant bears the initial burden of demonstrating that there is no genuine issue as to any material fact and the evidence submitted must be construed in favor of the opposing party. *Id.* The movant is required to include a statement of material facts not at issue and may include affidavits setting forth the facts that would be admissible in evidence. *See* 10 C.F.R. § 2.710(a)-(b). Once the moving party satisfies its initial burden, the opposing party may not rest upon "mere allegations or denials," but must submit rebutting evidence setting forth "specific facts showing that there is a genuine issue of fact." *See* 10 C.F.R. § 2.710(b); *see also Advanced Medical*, CLI-93-22, 38 NRC at 102.

In addition, it is often necessary to consider the scope of a contention in order to determine whether summary disposition is appropriate. *See, e.g., Duke Energy Corp.* (McGuire

Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-02-28, 56 NRC 373, 378-84 (2002) ("*McGuire*"). The Commission has held that a contention contesting an applicant's ER may be viewed as a challenge to the Staff's subsequently issued DEIS. *See Louisiana Energy Services, L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 84 (1998) (*"LES"*). The Commission has also held that, "[w]here a contention alleges the omission of particular information or an issue from an application, and the information is later supplied by the applicant or considered by the Staff in a draft EIS, the contention is moot." *McGuire*, CLI-02-28, 56 NRC at 383. Summary disposition is an appropriate procedural mechanism to resolve a mooted contention. *See id.* at 384.

As more fully set forth below, the Staff submits that summary disposition of EC 1.2 is appropriate in accordance with these standards.

II. Applicant's Motion for Summary Disposition of EC 1.2

The Joint Intervenors' Contention EC 1.2 deals with three distinct types of aquatic impacts (*i.e.*, impingement/entrainment, chemical effluent, and thermal effluent impacts). Because summary disposition may be appropriate for "all or any part" of the matters involved in a proceeding, the Staff addresses the summary disposition standard with respect to each impact separately. *See* 10 C.F.R. § 2.710(a).

A. Summary Disposition on Impingement/Entrainment Impacts

As the Board observed, the bases for the Joint Petitioners' Contention EC 1.2 is found in the declaration of Dr. Shawn Paul Young ("Young Declaration") that accompanied the Petition. *See Vogtle ESP*, LBP-07-3, 65 NRC at 258. Through the Young Declaration, the Joint Intervenors assert that the ER is deficient in three major aspects with respect to impingement/entrainment impacts: (1) the ER fails to include a comprehensive discussion of all the aquatic species likely to occur in the Savannah River at different times of the year; (2) the ER fails to consider appropriateness of the assumption of a uniformly distributed drift

community; and (3) the ER fails to calculate normal and worst case entrainment based upon species composition in the Savannah River at different river flows. Young Declaration ¶¶ 9-16. However, the DEIS and the Joint Affidavit of Christopher B. Cook and Rebekah H. Krieg demonstrate that the Staff cured these purported deficiencies.

1. Comprehensive Discussion of the Savannah River Fish Assemblage

Dr. Young claims that "the analysis of the intake structure is flawed because it provides only a vague summary of some fish species and life histories, rather than a comprehensive discussion of all of the species likely to inhabit the reach of the Savannah River at different times of the year." Young Declaration ¶ 16. "In fact," as Dr. Young asserts, "the ER discusses only those species and their life stages that have a lower probability of entrainment and neglect to address those with high susceptibility." *Id.* To that end, Dr. Young notes that the ER failed to discuss the potential impact on several "important and commercially valuable species," including the shortnose sturgeon, the American shad, and the blueback herring. *Id.* According to Dr. Young, to cure these deficiencies, Southern should conduct site-specific studies, such as "seasonal field studies to determine species composition, distribution, and vulnerability to entrainment at the existing intake structures." Young Declaration ¶ 10.

Including all of the above-listed information alleged omitted from the ER, the DEIS renders all of the aforementioned allegations of Dr. Young moot. The NRC Staff reviewed numerous sources—including the 2001 and 2003 editions of the Academy of Natural Sciences, Philadelphia Savannah River Site field study series—to determine the constituency of the fish assemblage for the Middle Savannah River. *See* Cook/Krieg Aff. ¶¶ 12, 14. In fact, over 30 sources were referenced in the DEIS. *See* Cook/Krieg Aff. ¶¶ 12, 14. Table 2-7 of the DEIS lists, by phylogenic order, all known native, resident, diadromous, marine and upland species of fish of the Middle Savannah River. *See* Cook/Krieg Aff. ¶ 12; DEIS at 2-76 – 2-78.

Using the methodology given in the Environmental Standard Review Plan ("ESRP")

Section 2.4.2, the NRC Staff determined which species listed in DEIS Table 2-7 are "important" (i.e., commercially or recreationally important, a species of interest, or threatened, endangered, or a species of concern). *See* Cook/Krieg Aff. ¶ 13. Accordingly, the DEIS characterizes American shad as a commercially important species (DEIS at 2-79 – 2-80); striped bass as a recreationally important species (DEIS at 2-80 – 2-81); the robust redhorse as a species of interest (DEIS at 2-83); and the shortnose sturgeon as a federally endangered species. *See* Cook/Krieg Aff. ¶ 13; DEIS at 2-87 – 2-91.[6] Thereafter, the DEIS analyzes the potential impacts of impingement/entrainment on the above-cited species (including, for all of the species, any life history phases of particular susceptibility to impingement/entrainment impacts, such as egg and larval). *See* Cook/Krieg Aff. ¶¶ 15-18; DEIS at 5-23 – 5-26, 7-15.

Given this discussion of the aquatic species likely to be impacted by impingement/ entrainment in the Savannah River, those alleged omissions in the ER have been cured.

2. The Assumption of a Uniformly Distributed Drift Community

Dr. Young contends that ER's assumption of a uniformly distributed drift community is "invalid" because (1) "the pattern of drift community distribution (i.e., the pattern of egg, larval and early juvenile stages of fish) would vary in time and space due to river flow fluctuations"; (2) "[t]he Savannah River fish assemblage utilizes several life history strategies to survive the inherent temporal and spatial heterogeneity of riverine habitats"; and (3) "dispersal mechanisms also vary from species to species and also across life history stages of each species." Young Declaration ¶ 12. While Dr. Young does not mention specific species, with regard to the instant allegation, Dr. Young does provide a list of physiological characteristics that would "make some

[6] The DEIS also acknowledges that "[t]here is a commercial blueback herring fishery on the South Carolina portions of the Savannah River, but no herring are taken in Georgia because of netting restrictions." DEIS at 2-80. Thus, for the purposes of the DEIS, the Staff did not consider the blueback herring as a commercially important species. *See* Cook/Krieg Aff. ¶ 15 n. 4.

species more susceptible to entrainment than others" – namely "(a) adhesive versus buoyant eggs; (b) immobile larvae versus highly mobile larvae; and (c) resident fish with small home ranges (that may avoid VEGP) versus migratory fish that must ultimately pass VEGP during vulnerable early life history stages on their journey down the Savannah River to the Atlantic Ocean." *Id.*

In contrast to the ER, the DEIS provides justification for the use of the assumption of a uniformly distributed drift community. *See* Cook/Krieg Aff. ¶ 15. The DEIS explains that the assumption of a uniformly distributed drift community is conservative, because "[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 or otherwise not be susceptible to transport into the canal." *See* Cook/Krieg Aff. ¶ 15; DEIS at 5-25.

In addition, as part of its DEIS review, the NRC Staff did not identify any species that would give rise to a concern over the propriety of the assumption of a uniformly distributed drift community (due to its particular habit, life cycle, or physiology). *See* Cook/Krieg Aff. ¶ 15. Thus, the DEIS considers the appropriateness of the assumption of a uniformly distributed drift community, and, as a result, cures that alleged deficiency in the ER.

3. Normal and Worst Case Scenarios

Dr. Young asserts that the "ER does not calculate normal and worst case scenarios based upon species composition in the river channel at different flows." Young Declaration at 6-7. To that end, Dr. Young, using information supplied in the ER, calculates a value for maximum cumulative withdrawal, 6.5% of the 7Q10 flow. *Id.*

In contrast to the ER, the DEIS provides an evaluation of the magnitude of the surface-water withdrawals against a range of river discharges. *See* Cook/Krieg Aff. ¶¶ 9-11; DEIS at 5-7, 7-4. In particular, Table 5-1 of the DEIS shows the percentage of water withdrawn from the Savannah River at both the normal and the maximum withdrawal rates for the proposed VEGP

Units 3 and 4 at four different flow levels, including average condition levels and Drought Level 3.[7] *See* Cook/Krieg Aff. ¶ 9; DEIS at 5-7.

Similarly, DEIS Table 7-1 provides the combined percentage of water withdrawn by the existing Units 1 and 2 and the proposed Units 3 and 4 at the normal withdrawal rate at four different river flow levels (again, including Drought Level 3). *See* Cook/Krieg Aff. ¶ 11; DEIS at 7-4. While the DEIS does not explicitly calculate the cumulative maximum withdrawal rate for existing Units 1 and 2 and proposed Units 3 and 4, this withdrawal rate can be calculated by combining information in the DEIS with information in the "Final Environmental Impact Statement Related to the Operation of Vogtle Electronic Generating Plant, Units 1 and 2," NUREG-1087 (1985). *See* Cook/Krieg Aff. ¶¶ 10-11. Even at this percentage withdrawn from the river, the impacts due to impingement/entrainment would still be small. *See* Cook/Krieg Aff. ¶¶ 17-18.

Based on the above, the Staff considered the entrainment impacts based on normal and worst case rivers flows in its DEIS. As a result, that alleged deficiency in the ER has been cured.

4. Impingement/Entrainment Impact Conclusion

The Joint Intervenors assert that the ER is deficient in three aspects: (1) the ER fails to include a comprehensive discussion of all the aquatic species likely to occur in the Savannah River at different times of the year; (2) the ER fails to consider appropriateness of the assumption of a uniformly distributed drift community; and (3) the ER fails to calculate normal and worst case entrainment based upon species composition in the Savannah River at different

[7] The DEIS did not consider impacts at Drought Level 4 because river flow cannot be calculated because the U.S. Army Corps of Engineers (USACE) Drought Contingency Plan does not specify the river discharge at this level. Cook/Krieg Aff. ¶ 9.

river flows. The DEIS, as shown above, addresses each of the Joint Intervenors' alleged deficiencies in the ER. As a result, Commission precedent holds that the Joint Intervenors' contention is moot. *See McGuire*, CLI-02-28, 56 NRC at 383. Accordingly, the Board should grant Southern's motion for summary disposition with respect to this portion of Contention 1.2.

B. Summary Disposition on Chemical Effluent Impacts

The chemical effluent portion of Contention EC 1.2 addresses an omission challenge to the impact assessment of the ER that was based on the alleged failure of Southern to "characterize the discharge in terms of constituents and amount." Petition for Intervention at 11 (Dec. 11, 2006) ("Petition"). The Joint Petitioners note that the ER listed "some of the chemical constituents of the proposed discharge," but took issue with the fact that it did not "disclose whether chemical constituents in the liquid effluent will be discharged at harmful levels." Petition at 11-12. In essence, the Joint Intervenors allege that the chemical effluent impact analysis was deficient because Southern failed to disclose the levels at which liquid chemical discharge effluents would be discharged.

Unlike the ER, however, the DEIS includes a list of chemicals, their use, the concentration that is anticipated to be discharged from proposed VEGP Units 3 and 4, and the toxicity data from the Material Safety Data Sheets for each of the chemicals that will likely be discharged to the Savannah River. *See* Cook/Krieg Aff. ¶¶ 22-23; DEIS at 5-28. With this additional information, the Staff evaluated the impacts from chemical discharges to the Savannah River and concluded that the impacts to the aquatic ecology of the Savannah River from these chemicals would be minimal. *See* Cook/Krieg Aff. ¶ 23; DEIS at 5-29, 7-16.

As discussed above, the chemical effluent portion of Contention EC 1.2 alleged that Southern's ER omitted information addressing whether chemical discharge effluents would be discharged at harmful levels. However, the Staff's DEIS has now addressed whether chemical discharge effluents would be discharged at harmful levels. As such, the Board should find that

the Joint Intervenors' alleged omission of information in the ER has been rendered moot by the DEIS and grant the Southern summary disposition with respect to this portion of Contention EC 1.2. *See McGuire*, CLI-02-28, 56 NRC at 383.

C. Summary Disposition on Thermal Impacts

The Joint Intervenors allege, through the Declaration of Dr. Young, that, with respect to thermal impacts, there are two deficiencies in the ER: (1) the ER fails to present any modeling or data as to the impacts of the thermal effluent plume at varying levels of river flow, and (2) the ER fails to provide a comprehensive discussion of the Savannah River fish assemblage (including, for all species, discussion of all susceptible life history stages). Young Declaration ¶ 17-21. As to the first omission, Dr. Young asserts the following:

> [N]o modeling or data are presented for thermal discharge impacts at the variable-river flows that occur on the Middle Savannah River. . . . [A] worst case scenario that produces a maximum impact from the thermal discharge would be the 7Q10 flows of 3,828[cfs]. Reduced flow places more of the drift community at danger of thermal impacts due to river channel confinement. That is, low water levels confine organisms to a smaller habitat, concentrating the number of organisms per unit of area in the vicinity of the thermal plume. This confinement increases the vulnerability to thermal stress and mortality.

Young Declaration ¶ 18. As to the second omission, Dr. Young provides an example of the type of information left out of the ER:

> For instance, SNC states that American shad spawning migration does not appear to be blocked by the thermal-plume, and spawn farther upstream with egg and larval development also occurring upstream, all facts favorable to their application. However, they fail to include that American shad may also spawn in the vicinity near VEGP and Savannah River Site (Paller et al. 1986), and larvae and juveniles will be migrating downstream during their first summer and will migrate through the vicinity of VEGP thermal discharge and intakes.

Young Declaration ¶ 17. Dr. Young also provides the temperatures that adversely impact eggs and larvae of several different species (American Shad, Blueback Herring, Shortnose Sturgeon

and Striped Bass), and asserts that, given the temperature of the discharge could exceed these temperatures, there might be significant impacts. Young Declaration ¶¶ 19-21.

The DEIS addresses both of the alleged deficiencies in the ER's thermal impact analysis. First, in its CORMAX analysis of impacts related to the thermal effluent plume, the NRC Staff assumed conservative river conditions, including a Drought Level 3 river flow rate. *See* Cook/Krieg Aff. ¶¶ 19-20; DEIS at 5-26. Next, to provide additional conservatism to its analysis, the Staff assumed that the thermal plume for proposed VEGP Units 3 and 4 and the thermal plume for Units 1 and 2 were combined as one plume, despite the fact that the two discharges are separated by 404 feet. *See* Cook/Krieg Aff. ¶ 19; DEIS at 5-14.

Based on its calculations of the modeled plume size, duration, temperature and temperature differential (for different river flow levels and temperatures of the river at different times of the year), the Staff concluded that, for the species the Staff identified pursuant to ESRP Section 2.4.2, the impacts would be small. *See* Cook/Krieg Aff. ¶ 21; DEIS at 5-26 – 5-27.

Moreover, in light of the fact that the plume is small relative to the size of the river at the discharge location, fish and other aquatically-mobile organisms could simply avoid the plume. *See* Cook/Krieg Aff. ¶ 21; DEIS at 5-26. For those organisms that could not effectively swim away, such as ichthyoplankton, the Staff found that, given the size and temperature duration of the thermal plume, the number of such organisms lost would be so small as to not noticeably impact the population of the organisms. *See* Cook/Krieg Aff. ¶ 21.

As shown above, the DEIS cures the alleged deficiencies in the ER concerning the potential impacts of the thermal plume. As previously stated, "[w]here a contention alleges the omission of particular information or an issue from an application, and the information is later supplied by the applicant or considered by the Staff in a draft EIS, the contention is moot." *McGuire*, CLI-02-28, 56 NRC at 383. In light of the foregoing, the Board should grant the Southern summary disposition motion with respect to this portion of Contention EC 1.2.

D. Conclusion on Applicant's Motion for Summary Disposition

As demonstrated above, the DEIS identifies and considers the impacts of impingement/entrainment and chemical and thermal effluent discharges on the aquatic resources of the Savannah River. As a result, the DEIS provides the above-identified analyses that were allegedly omitted from Southern's ER.

The National Environmental Policy Act (NEPA) requires that the NRC, as a federal agency, take a "hard look" at the potential environmental impacts of a proposed action. *See LES*, CLI-98-3, 47 NRC at 87-88. Because the DEIS complies with this NEPA requirement, by providing thorough analyses, based on available technical information, in sufficient detail to ensure that environmental consequences have been fairly evaluated, Southern is entitled to judgment in its favor, as a matter of law.

III. Staff Analysis of Southern's Statement of Material Facts

With its motion, Southern has appended a "Statement of Undisputed Facts in Support of the Applicant's Motion for Summary Disposition of Intervenors' Environmental Contention 1.2" ("Fact Statement"), in which Southern identifies twenty-four material facts it claims are not in dispute. Southern concludes that, based on these facts, there is no genuine factual dispute remaining that would preclude summary disposition on EC 1.2. For the reasons described above, the Staff generally agrees with the material facts identified by Southern, and the Staff supports the motion for summary disposition. However, the Staff provides its assessment of the following Material Fact submitted by Southern to clarify the record:

> Material Fact 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." Fact Statement at 4.

The Staff disagrees with the statement that Table 7-1 of the DEIS provides *maximum*

withdrawal rates for Units 1 and 2. The data in Table 7-1 of the DEIS is based on the *normal* withdrawal rates for VEGP Units 1 and 2 and proposed VEGP Units 3 and 4, which, during Drought Level 3 conditions, amounts to a surface water withdrawal rate of 4.6 percent. Similarly, Section 7.3.1.1 of the DEIS also assumed normal withdrawal rates. *See* Cook/Krieg Aff. ¶ 9. Based on the maximum withdrawal rates calculated in Section 5.3.2.1 of the DEIS and shown in Table 5-1 of the DEIS, proposed VEGP Units 3 and 4 would withdraw 3.4 percent of the total flow of the Savannah River during Drought Level 3. *See* Cook/Krieg Aff. ¶ 9. Although not explicitly stated in the DEIS, the cumulative maximum withdrawal rate for VEGP Units 1 and 2 and proposed VEGP Units 3 and 4 would be 6.7 percent of the total flow of the Savannah River during Drought Level 3. *See* Cook/Krieg Aff. ¶ 9.

CONCLUSION

For the reasons discussed above, the NRC Staff submits that the Applicant's motion for summary disposition of EC 1.2 should be granted as a matter of law.

Respectfully submitted,

/signed (electronically) by/
Jonathan M. Rund
Brett Michael Patrick Klukan
Counsel for NRC Staff
U.S. Nuclear Regulatory Commission
Mail Stop O-15 D21
Washington, DC 20555-0001
(301) 415-1250, (301) 415-3629
JMR3@nrc.gov, BMK1@nrc.gov

Dated at Rockville, Maryland
this 29th day of October, 2007

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JOINT AFFIDAVIT OF CHRISTOPHER B. COOK AND REBEKAH H. KRIEG

Dr. Christopher B. Cook (CBC) and Ms. Rebekah H. Krieg (RHK) do hereby state as follows:[1]

1a. (CBC) I am employed as a senior hydrologist in the Division of Site and Environmental Reviews in the Nuclear Regulatory Commission's ("NRC") Office of New Reactors. I am the lead technical reviewer on the hydrology issues associated with the application submitted on August 15, 2006, by Southern Nuclear Operating Company, Inc. ("Southern" or "Applicant") for an early site permit ("ESP") for a site within the existing Vogtle Electric Generating Plant ("VEGP") site near Waynesboro, Georgia. Previously, I was employed as a Senior Research Scientist with the Hydrology Group at the U.S. Department of Energy's Pacific Northwest National Laboratory, operated by Battelle. While employed at the Laboratory, I was also the lead technical reviewer on hydrology issues associated with the application. A statement of my professional qualifications is attached.

1b. (RHK) I am employed as a Senior Research Scientist with the Ecology Group at the U.S. Department of Energy's Pacific Northwest National Laboratory, operated by Battelle. I am providing this Affidavit under a technical assistance contract with the NRC Staff ("Staff"). I

[1] In this Affidavit, the sponsor of each numbered paragraph is identified by their initials; no such designation is provided for paragraphs that are sponsored by both Affiants.

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A. In a Subpart L proceeding, such as this one, the Board must apply the summary disposition standard set forth in Subpart G. *See* 10 C.F.R. § 2.1205(c). Under this standard, a motion for summary disposition should be granted "if the filings in the proceeding, depositions, answers 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 that the moving party is entitled to a decision as a matter of law." 10 C.F.R. § 2.710(d)(2).

The Commission's summary disposition procedures have been analogized to Rule 56 of the Federal Rules of Civil Procedure. *See Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant), CLI-01-11, 53 NRC 370, 384 (2001); *Advanced Medical Systems, Inc.* (One Factory Row, Geneva, Ohio), CLI-93-22, 38 NRC 98, 102 (1993) (*"Advanced Medical"*). As such, the movant bears the initial burden of demonstrating that there is no genuine issue as to any material fact and the evidence submitted must be construed in favor of the opposing party. *Id.* The movant is required to include a statement of material facts not at issue and may include affidavits setting forth the facts that would be admissible in evidence. *See* 10 C.F.R. § 2.710(a)-(b). Once the moving party satisfies its initial burden, the opposing party may not rest upon "mere allegations or denials," but must submit rebutting evidence setting forth "specific facts showing that there is a genuine issue of fact." *See* 10 C.F.R. § 2.710(b); *see also Advanced Medical*, CLI-93-22, 38 NRC at 102.

In addition, it is often necessary to consider the scope of a contention in order to determine whether summary disposition is appropriate. *See, e.g., Duke Energy Corp.* (McGuire

Nuclear Station, Units 1 & 2; Catawba Nuclear Station, Units 1 & 2), CLI-02-28, 56 NRC 373, 378-84 (2002) ("*McGuire*"). The Commission has held that a contention contesting an applicant's ER may be viewed as a challenge to the Staff's subsequently issued DEIS. *See Louisiana Energy Services, L.P.* (Claiborne Enrichment Center), CLI-98-3, 47 NRC 77, 84 (1998) (*"LES"*). The Commission has also held that, "[w]here a contention alleges the omission of particular information or an issue from an application, and the information is later supplied by the applicant or considered by the Staff in a draft EIS, the contention is moot." *McGuire*, CLI-02-28, 56 NRC at 383. Summary disposition is an appropriate procedural mechanism to resolve a mooted contention. *See id.* at 384.

As more fully set forth below, the Staff submits that summary disposition of EC 1.2 is appropriate in accordance with these standards.

II. Applicant's Motion for Summary Disposition of EC 1.2

The Joint Intervenors' Contention EC 1.2 deals with three distinct types of aquatic impacts (*i.e.*, impingement/entrainment, chemical effluent, and thermal effluent impacts). Because summary disposition may be appropriate for "all or any part" of the matters involved in a proceeding, the Staff addresses the summary disposition standard with respect to each impact separately. *See* 10 C.F.R. § 2.710(a).

A. Summary Disposition on Impingement/Entrainment Impacts

As the Board observed, the bases for the Joint Petitioners' Contention EC 1.2 is found in the declaration of Dr. Shawn Paul Young ("Young Declaration") that accompanied the Petition. *See Vogtle ESP*, LBP-07-3, 65 NRC at 258. Through the Young Declaration, the Joint Intervenors assert that the ER is deficient in three major aspects with respect to impingement/entrainment impacts: (1) the ER fails to include a comprehensive discussion of all the aquatic species likely to occur in the Savannah River at different times of the year; (2) the ER fails to consider appropriateness of the assumption of a uniformly distributed drift

community; and (3) the ER fails to calculate normal and worst case entrainment based upon species composition in the Savannah River at different river flows. Young Declaration ¶¶ 9-16. However, the DEIS and the Joint Affidavit of Christopher B. Cook and Rebekah H. Krieg demonstrate that the Staff cured these purported deficiencies.

1. Comprehensive Discussion of the Savannah River Fish Assemblage

Dr. Young claims that "the analysis of the intake structure is flawed because it provides only a vague summary of some fish species and life histories, rather than a comprehensive discussion of all of the species likely to inhabit the reach of the Savannah River at different times of the year." Young Declaration ¶ 16. "In fact," as Dr. Young asserts, "the ER discusses only those species and their life stages that have a lower probability of entrainment and neglect to address those with high susceptibility." *Id.* To that end, Dr. Young notes that the ER failed to discuss the potential impact on several "important and commercially valuable species," including the shortnose sturgeon, the American shad, and the blueback herring. *Id.* According to Dr. Young, to cure these deficiencies, Southern should conduct site-specific studies, such as "seasonal field studies to determine species composition, distribution, and vulnerability to entrainment at the existing intake structures." Young Declaration ¶ 10.

Including all of the above-listed information alleged omitted from the ER, the DEIS renders all of the aforementioned allegations of Dr. Young moot. The NRC Staff reviewed numerous sources—including the 2001 and 2003 editions of the Academy of Natural Sciences, Philadelphia Savannah River Site field study series—to determine the constituency of the fish assemblage for the Middle Savannah River. *See* Cook/Krieg Aff. ¶¶ 12, 14. In fact, over 30 sources were referenced in the DEIS. *See* Cook/Krieg Aff. ¶¶ 12, 14. Table 2-7 of the DEIS lists, by phylogenic order, all known native, resident, diadromous, marine and upland species of fish of the Middle Savannah River. *See* Cook/Krieg Aff. ¶ 12; DEIS at 2-76 – 2-78.

Using the methodology given in the Environmental Standard Review Plan ("ESRP")

Section 2.4.2, the NRC Staff determined which species listed in DEIS Table 2-7 are "important" (i.e., commercially or recreationally important, a species of interest, or threatened, endangered, or a species of concern). *See* Cook/Krieg Aff. ¶ 13. Accordingly, the DEIS characterizes American shad as a commercially important species (DEIS at 2-79 – 2-80); striped bass as a recreationally important species (DEIS at 2-80 – 2-81); the robust redhorse as a species of interest (DEIS at 2-83); and the shortnose sturgeon as a federally endangered species. *See* Cook/Krieg Aff. ¶ 13; DEIS at 2-87 – 2-91.[6] Thereafter, the DEIS analyzes the potential impacts of impingement/entrainment on the above-cited species (including, for all of the species, any life history phases of particular susceptibility to impingement/entrainment impacts, such as egg and larval). *See* Cook/Krieg Aff. ¶¶ 15-18; DEIS at 5-23 – 5-26, 7-15.

Given this discussion of the aquatic species likely to be impacted by impingement/ entrainment in the Savannah River, those alleged omissions in the ER have been cured.

2. The Assumption of a Uniformly Distributed Drift Community

Dr. Young contends that ER's assumption of a uniformly distributed drift community is "invalid" because (1) "the pattern of drift community distribution (i.e., the pattern of egg, larval and early juvenile stages of fish) would vary in time and space due to river flow fluctuations"; (2) "[t]he Savannah River fish assemblage utilizes several life history strategies to survive the inherent temporal and spatial heterogeneity of riverine habitats"; and (3) "dispersal mechanisms also vary from species to species and also across life history stages of each species." Young Declaration ¶ 12. While Dr. Young does not mention specific species, with regard to the instant allegation, Dr. Young does provide a list of physiological characteristics that would "make some

[6] The DEIS also acknowledges that "[t]here is a commercial blueback herring fishery on the South Carolina portions of the Savannah River, but no herring are taken in Georgia because of netting restrictions." DEIS at 2-80. Thus, for the purposes of the DEIS, the Staff did not consider the blueback herring as a commercially important species. *See* Cook/Krieg Aff. ¶ 15 n. 4.

species more susceptible to entrainment than others" – namely "(a) adhesive versus buoyant eggs; (b) immobile larvae versus highly mobile larvae; and (c) resident fish with small home ranges (that may avoid VEGP) versus migratory fish that must ultimately pass VEGP during vulnerable early life history stages on their journey down the Savannah River to the Atlantic Ocean." *Id.*

In contrast to the ER, the DEIS provides justification for the use of the assumption of a uniformly distributed drift community. *See* Cook/Krieg Aff. ¶ 15. The DEIS explains that the assumption of a uniformly distributed drift community is conservative, because "[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 or otherwise not be susceptible to transport into the canal." *See* Cook/Krieg Aff. ¶ 15; DEIS at 5-25.

In addition, as part of its DEIS review, the NRC Staff did not identify any species that would give rise to a concern over the propriety of the assumption of a uniformly distributed drift community (due to its particular habit, life cycle, or physiology). *See* Cook/Krieg Aff. ¶ 15. Thus, the DEIS considers the appropriateness of the assumption of a uniformly distributed drift community, and, as a result, cures that alleged deficiency in the ER.

3. Normal and Worst Case Scenarios

Dr. Young asserts that the "ER does not calculate normal and worst case scenarios based upon species composition in the river channel at different flows." Young Declaration at 6-7. To that end, Dr. Young, using information supplied in the ER, calculates a value for maximum cumulative withdrawal, 6.5% of the 7Q10 flow. *Id.*

In contrast to the ER, the DEIS provides an evaluation of the magnitude of the surface-water withdrawals against a range of river discharges. *See* Cook/Krieg Aff. ¶¶ 9-11; DEIS at 5-7, 7-4. In particular, Table 5-1 of the DEIS shows the percentage of water withdrawn from the Savannah River at both the normal and the maximum withdrawal rates for the proposed VEGP

Units 3 and 4 at four different flow levels, including average condition levels and Drought Level 3.[7] *See* Cook/Krieg Aff. ¶ 9; DEIS at 5-7.

Similarly, DEIS Table 7-1 provides the combined percentage of water withdrawn by the existing Units 1 and 2 and the proposed Units 3 and 4 at the normal withdrawal rate at four different river flow levels (again, including Drought Level 3). *See* Cook/Krieg Aff. ¶ 11; DEIS at 7-4. While the DEIS does not explicitly calculate the cumulative maximum withdrawal rate for existing Units 1 and 2 and proposed Units 3 and 4, this withdrawal rate can be calculated by combining information in the DEIS with information in the "Final Environmental Impact Statement Related to the Operation of Vogtle Electronic Generating Plant, Units 1 and 2," NUREG-1087 (1985). *See* Cook/Krieg Aff. ¶¶ 10-11. Even at this percentage withdrawn from the river, the impacts due to impingement/entrainment would still be small. *See* Cook/Krieg Aff. ¶¶ 17-18.

Based on the above, the Staff considered the entrainment impacts based on normal and worst case rivers flows in its DEIS. As a result, that alleged deficiency in the ER has been cured.

4. Impingement/Entrainment Impact Conclusion

The Joint Intervenors assert that the ER is deficient in three aspects: (1) the ER fails to include a comprehensive discussion of all the aquatic species likely to occur in the Savannah River at different times of the year; (2) the ER fails to consider appropriateness of the assumption of a uniformly distributed drift community; and (3) the ER fails to calculate normal and worst case entrainment based upon species composition in the Savannah River at different

[7] The DEIS did not consider impacts at Drought Level 4 because river flow cannot be calculated because the U.S. Army Corps of Engineers (USACE) Drought Contingency Plan does not specify the river discharge at this level. Cook/Krieg Aff. ¶ 9.

river flows. The DEIS, as shown above, addresses each of the Joint Intervenors' alleged deficiencies in the ER. As a result, Commission precedent holds that the Joint Intervenors' contention is moot. *See McGuire*, CLI-02-28, 56 NRC at 383. Accordingly, the Board should grant Southern's motion for summary disposition with respect to this portion of Contention 1.2.

B. Summary Disposition on Chemical Effluent Impacts

The chemical effluent portion of Contention EC 1.2 addresses an omission challenge to the impact assessment of the ER that was based on the alleged failure of Southern to "characterize the discharge in terms of constituents and amount." Petition for Intervention at 11 (Dec. 11, 2006) ("Petition"). The Joint Petitioners note that the ER listed "some of the chemical constituents of the proposed discharge," but took issue with the fact that it did not "disclose whether chemical constituents in the liquid effluent will be discharged at harmful levels." Petition at 11-12. In essence, the Joint Intervenors allege that the chemical effluent impact analysis was deficient because Southern failed to disclose the levels at which liquid chemical discharge effluents would be discharged.

Unlike the ER, however, the DEIS includes a list of chemicals, their use, the concentration that is anticipated to be discharged from proposed VEGP Units 3 and 4, and the toxicity data from the Material Safety Data Sheets for each of the chemicals that will likely be discharged to the Savannah River. *See* Cook/Krieg Aff. ¶¶ 22-23; DEIS at 5-28. With this additional information, the Staff evaluated the impacts from chemical discharges to the Savannah River and concluded that the impacts to the aquatic ecology of the Savannah River from these chemicals would be minimal. *See* Cook/Krieg Aff. ¶ 23; DEIS at 5-29, 7-16.

As discussed above, the chemical effluent portion of Contention EC 1.2 alleged that Southern's ER omitted information addressing whether chemical discharge effluents would be discharged at harmful levels. However, the Staff's DEIS has now addressed whether chemical discharge effluents would be discharged at harmful levels. As such, the Board should find that

the Joint Intervenors' alleged omission of information in the ER has been rendered moot by the DEIS and grant the Southern summary disposition with respect to this portion of Contention EC 1.2. *See McGuire*, CLI-02-28, 56 NRC at 383.

C. Summary Disposition on Thermal Impacts

The Joint Intervenors allege, through the Declaration of Dr. Young, that, with respect to thermal impacts, there are two deficiencies in the ER: (1) the ER fails to present any modeling or data as to the impacts of the thermal effluent plume at varying levels of river flow, and (2) the ER fails to provide a comprehensive discussion of the Savannah River fish assemblage (including, for all species, discussion of all susceptible life history stages). Young Declaration ¶ 17-21. As to the first omission, Dr. Young asserts the following:

> [N]o modeling or data are presented for thermal discharge impacts at the variable-river flows that occur on the Middle Savannah River. . . . [A] worst case scenario that produces a maximum impact from the thermal discharge would be the 7Q10 flows of 3,828[cfs]. Reduced flow places more of the drift community at danger of thermal impacts due to river channel confinement. That is, low water levels confine organisms to a smaller habitat, concentrating the number of organisms per unit of area in the vicinity of the thermal plume. This confinement increases the vulnerability to thermal stress and mortality.

Young Declaration ¶ 18. As to the second omission, Dr. Young provides an example of the type of information left out of the ER:

> For instance, SNC states that American shad spawning migration does not appear to be blocked by the thermal-plume, and spawn farther upstream with egg and larval development also occurring upstream, all facts favorable to their application. However, they fail to include that American shad may also spawn in the vicinity near VEGP and Savannah River Site (Paller et al. 1986), and larvae and juveniles will be migrating downstream during their first summer and will migrate through the vicinity of VEGP thermal discharge and intakes.

Young Declaration ¶ 17. Dr. Young also provides the temperatures that adversely impact eggs and larvae of several different species (American Shad, Blueback Herring, Shortnose Sturgeon

and Striped Bass), and asserts that, given the temperature of the discharge could exceed these temperatures, there might be significant impacts. Young Declaration ¶¶ 19-21.

The DEIS addresses both of the alleged deficiencies in the ER's thermal impact analysis. First, in its CORMAX analysis of impacts related to the thermal effluent plume, the NRC Staff assumed conservative river conditions, including a Drought Level 3 river flow rate. *See* Cook/Krieg Aff. ¶¶ 19-20; DEIS at 5-26. Next, to provide additional conservatism to its analysis, the Staff assumed that the thermal plume for proposed VEGP Units 3 and 4 and the thermal plume for Units 1 and 2 were combined as one plume, despite the fact that the two discharges are separated by 404 feet. *See* Cook/Krieg Aff. ¶ 19; DEIS at 5-14.

Based on its calculations of the modeled plume size, duration, temperature and temperature differential (for different river flow levels and temperatures of the river at different times of the year), the Staff concluded that, for the species the Staff identified pursuant to ESRP Section 2.4.2, the impacts would be small. *See* Cook/Krieg Aff. ¶ 21; DEIS at 5-26 – 5-27.

Moreover, in light of the fact that the plume is small relative to the size of the river at the discharge location, fish and other aquatically-mobile organisms could simply avoid the plume. *See* Cook/Krieg Aff. ¶ 21; DEIS at 5-26. For those organisms that could not effectively swim away, such as ichthyoplankton, the Staff found that, given the size and temperature duration of the thermal plume, the number of such organisms lost would be so small as to not noticeably impact the population of the organisms. *See* Cook/Krieg Aff. ¶ 21.

As shown above, the DEIS cures the alleged deficiencies in the ER concerning the potential impacts of the thermal plume. As previously stated, "[w]here a contention alleges the omission of particular information or an issue from an application, and the information is later supplied by the applicant or considered by the Staff in a draft EIS, the contention is moot." *McGuire*, CLI-02-28, 56 NRC at 383. In light of the foregoing, the Board should grant the Southern summary disposition motion with respect to this portion of Contention EC 1.2.

D. Conclusion on Applicant's Motion for Summary Disposition

As demonstrated above, the DEIS identifies and considers the impacts of impingement/entrainment and chemical and thermal effluent discharges on the aquatic resources of the Savannah River. As a result, the DEIS provides the above-identified analyses that were allegedly omitted from Southern's ER.

The National Environmental Policy Act (NEPA) requires that the NRC, as a federal agency, take a "hard look" at the potential environmental impacts of a proposed action. *See LES*, CLI-98-3, 47 NRC at 87-88. Because the DEIS complies with this NEPA requirement, by providing thorough analyses, based on available technical information, in sufficient detail to ensure that environmental consequences have been fairly evaluated, Southern is entitled to judgment in its favor, as a matter of law.

III. Staff Analysis of Southern's Statement of Material Facts

With its motion, Southern has appended a "Statement of Undisputed Facts in Support of the Applicant's Motion for Summary Disposition of Intervenors' Environmental Contention 1.2" ("Fact Statement"), in which Southern identifies twenty-four material facts it claims are not in dispute. Southern concludes that, based on these facts, there is no genuine factual dispute remaining that would preclude summary disposition on EC 1.2. For the reasons described above, the Staff generally agrees with the material facts identified by Southern, and the Staff supports the motion for summary disposition. However, the Staff provides its assessment of the following Material Fact submitted by Southern to clarify the record:

> Material Fact 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." Fact Statement at 4.

The Staff disagrees with the statement that Table 7-1 of the DEIS provides *maximum*

withdrawal rates for Units 1 and 2. The data in Table 7-1 of the DEIS is based on the *normal* withdrawal rates for VEGP Units 1 and 2 and proposed VEGP Units 3 and 4, which, during Drought Level 3 conditions, amounts to a surface water withdrawal rate of 4.6 percent. Similarly, Section 7.3.1.1 of the DEIS also assumed normal withdrawal rates. *See* Cook/Krieg Aff. ¶ 9. Based on the maximum withdrawal rates calculated in Section 5.3.2.1 of the DEIS and shown in Table 5-1 of the DEIS, proposed VEGP Units 3 and 4 would withdraw 3.4 percent of the total flow of the Savannah River during Drought Level 3. *See* Cook/Krieg Aff. ¶ 9. Although not explicitly stated in the DEIS, the cumulative maximum withdrawal rate for VEGP Units 1 and 2 and proposed VEGP Units 3 and 4 would be 6.7 percent of the total flow of the Savannah River during Drought Level 3. *See* Cook/Krieg Aff. ¶ 9.

CONCLUSION

For the reasons discussed above, the NRC Staff submits that the Applicant's motion for summary disposition of EC 1.2 should be granted as a matter of law.

Respectfully submitted,

/signed (electronically) by/
Jonathan M. Rund
Brett Michael Patrick Klukan
Counsel for NRC Staff
U.S. Nuclear Regulatory Commission
Mail Stop O-15 D21
Washington, DC 20555-0001
(301) 415-1250, (301) 415-3629
JMR3@nrc.gov, BMK1@nrc.gov

Dated at Rockville, Maryland
this 29th day of October, 2007

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF ANSWER TO SOUTHERN NUCLEAR OPERATING COMPANY'S MOTION FOR SUMMARY DISPOSITION OF ENVIRONMENTAL CONTENTION 1.2," together with the "JOINT AFFIDAVIT OF CHRISTOPHER B. COOK AND REBEKAH H. KRIEG," have been served upon the following persons by Electronic Information Exchange this 29th day of October, 2007:

Administrative Judge
G. Paul Bollwerk, III, Chair
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: gpb@nrc.gov)

Administrative Judge
Nicholas G. Trikouros
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: ngt@nrc.gov)

Administrative Judge
James Jackson
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: jackson538@comcast.net)

Office of Commission Appellate Adjudication
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: ocaamail@nrc.gov)
Copy provided by e-mail only

Margaret Parish
Law Clerk
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: map4@nrc.gov)

Office of the Secretary
ATTN: Docketing and Service
Mail Stop 0-16C1
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
(E-mail: HEARINGDOCKET@nrc.gov)

Diane Curran, Esq.
Harmon, Curran, Spielberg &
Eisenberg, LLP
1726 M Street, NW
Suite 600
Washington, DC 20036
(E-mail: dcurran@harmoncurran.com)

Mary Maclean D. Asbill, Esq.
Lawrence D. Sanders, Esq.
Turner Environmental Law Clinic
Emory University School of Law
1301 Clifton Road
Atlanta, GA 30322
(E-mail: masbill@law.emory.edu;
lsanders@law.emory.edu)

M. Stanford Blanton, Esq.
Peter D. LeJeune, Esq.
C. Grady Moore, III, Esq.
Kenneth C. Hairston, Esq.
Balch & Bingham LLP
1710 Sixth Avenue North
Birmingham, AL 35203-2014
(E-mail: sblanton@balch.com;
plejeune@balch.com;
kchairston@balch.com;
gmoore@balch.com)

Moanica Caston, Esq.
Southern Nuclear Operating Co., Inc.
40 Inverness Center Parkway
P.O. Box 1295, Bin B-022
Birmingham, AL 35201-1295
(E-mail: mcaston@southernco.com)
Copy provided by e-mail only

Steven P. Frantz, Esq.
Kathryn M. Sutton, Esq.
Paul M. Bessette, Esq.
Mary Freeze
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004
(E-mail: sfrantz@morganlewis.com;
ksutton@morganlewis.com;
pbessette@morganlewis.com;
mfreeze@morganlewis.com)

Jeffrey Stair, Esq.
Georgia Public Service Commission
244 Washington Street
Atlanta, GA 30334
(E-mail: jeffreys@psc.state.ga.us)
Copy provided by e-mail only

/signed (electronically) by/
Jonathan M. Rund
Counsel for the NRC Staff
U.S. Nuclear Regulatory Commission
Mail Stop O-15 D21
Washington, DC 20555-0001
(301) 415-1250
JMR3@nrc.gov

am the lead technical reviewer on aquatic ecology issues associated with the application submitted by Southern for an ESP for a site within the existing VEGP site near Waynesboro, Georgia. As the lead technical reviewer on aquatic ecology issues, I participated as part of the NRC staff's project review team, here-in referred to as "the staff." A statement of my professional qualifications is attached.

2. This Affidavit is in response to "Southern Nuclear Operating Company's Motion for Summary Disposition of Intervenors' Environmental Contention 1.2 (Cooling System Impacts on Aquatic Resources)" ("Southern EC 1.2 Motion"), and the "Southern Nuclear Operating Company's Statement of Undisputed Facts in Support of Applicant's Motion for Summary Disposition of Intervenors' Environmental Contention 1.2 (Cooling System Impacts on Aquatic Resources)" ("Southern EC 1.2 Fact Statement") attached thereto.

3a. (CBC) As part of my official responsibilities as the lead technical reviewer on the hydrology issues associated with the application, I evaluated the incremental and cumulative direct physical and thermal effects to aquatic habitat in the Savannah River associated with operation of the existing VEGP Units 1 and 2 and the proposed VEGP Units 3 and 4. My assessment is discussed in Sections 5.3 and 7.3 of NUREG-1872, "Draft Environmental Impact Statement for an Early Site Permit (ESP) at the Vogtle Electric Generating Plant Site," September 2007 ("DEIS").

3b. (RHK) As part of my official responsibilities as the aquatic ecology reviewer, I evaluated impingement, entrainment, and the chemical and thermal effects on aquatic biota in the Savannah River, associated with operation of the proposed VEGP Units 3 and 4 as well as the cumulative effects associated from the existing VEGP Units 1 and 2. My assessment of the

impacts to aquatic biology expected to result from the operation of VEGP Units 1 and 2 and VEGP Units 3 and 4 is presented in Sections 5.4.2 and 5.4.3, and 7.5 the DEIS.

4. Contention EC 1.2 submitted in this proceeding by the 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 (collectively, "Joint Intervenors"), as restated by the Atomic Safety and Licensing Board in its Memorandum and Order of March 12, 2007,[2] alleges that:

> The [Environmental Report (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.[3]

We are familiar with the contention and the bases submitted in its support presented in the Joint Intervenors' filing dated December 11, 2006, which included the Declaration of Shawn Paul Young, Ph.D. It is our understanding that the basis of the contention concerns the impacts to the biota of the Savannah River from the operation of an intake and discharge structure as part of the cooling water system for Units 3 and 4.

5. Based on our independent review, the overall impacts on aquatic ecosystems from the operation of the existing VEGP Units 1 and 2 and VEGP Units 3 and 4 would be small. *See* DEIS at 5-30, 5-32 to -33, 7-16 to -17. Thus, except as indicated elsewhere in this Affidavit, we concur with the conclusions provided in the Southern EC 1.2 Fact Statement.

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[2] *Southern Nuclear Operating Co.* (Early Site Permit for Vogtle ESP Site), LBP-07-3, 65 NRC 237 (2006).

[3] *Vogtle*, LBP-07-3, 65 NRC at 280.

6. This Affidavit reflects our previous familiarity and our recent review of the following documents:

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U.S. Nuclear Regulatory Commission (NRC). 1985. *Final Environmental Statement Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2*. NUREG-1087, U.S. Nuclear Regulatory Commission, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2007a. Trip Report – March 7 through 9, 2007, Vogtle Electric Generating Plant (VEGP) Early Site Permit (ESP) Site Visit. April 3, 2007, Washington, D.C.

U.S. Nuclear Regulatory Commission (NRC). 2007b. Conference Call Summary – June 20, 2007, Discussion with Southern Nuclear Operating Co. concerning inconsistencies between ER Rev 2 and RAIs. Washington, D.C. Accession No. ML0718402438.

Description of Proposed Savannah River Withdrawals and Discharges for Units 3 and 4

7. (CBC) Southern states in Table 3.1-1 of the ER that the Savannah River would only be used as the make-up water source for the circulating water/turbine plant cooling water

system. Plant effluent would be discharged to the Savannah River where the residual heat and chemicals would create a plume. Southern states the following bounding water fluxes for the combined operation of Units 3 and 4:

- The maximum withdrawal from the Savannah River would be 3.65 m^3/s (129 cfs)
- The maximum effluent discharge to the Savannah River would be 1.94 m^3/s (68.5 cfs).

Description of Savannah River

8. (CBC) J. Strom Thurmond Dam, which lies 71 River Miles (RM) upstream of the VEGP site, regulates Savannah River discharge in the vicinity of the site. Discharges released from the dam are a function of Drought Level, which is defined by the U.S. Army Corps of Engineers (USACE) to be a function of the water volume impounded at Thurmond Dam and the cascade of upstream reservoirs. The drought conditions of 2002 resulted in a new drought of record for the Savannah River Basin (USACE 2006). Following this period of drought, the Drought Contingency Plan (DCP) was updated for the basin, and releases from Thurmond Dam at each Drought Level are currently as follows:

- Level 1: Weekly-average release discharge of 119 m^3/s (4200 cfs)
- Level 2: Weekly-average release discharge of 113 m^3/s (4000 cfs)
- Level 3: Daily-average release discharge of 108 m^3/s (3800 cfs)
- Level 4: Inflow to Thurmond Dam equals release discharge.

The Savannah River basin is currently experiencing a period of relative drought, and the DCP is being implemented as outlined above. On August 16, 2007, hydrologists with the USACE Savannah District announced that the river system had entered Drought Level 2 (USACE, 2007).

Surface Water Impacts

9. (CBC) The magnitude of the impact of surface-water withdrawals associated with operating VEGP Units 3 and 4 would fluctuate with discharge in the Savannah River. The intake structure for Units 3 and 4 is proposed to be located approximately 600 m (2000 ft) upstream of the VEGP Units 1 and 2 intake structure. The staff evaluated the magnitude of the surface-water withdrawals against a range of river discharges. Results presented in Table 5-1 of the DEIS show that at the normal withdrawal rate of 2.35 m^3/s (83 cfs), VEGP Units 3 and 4 would withdraw less than 1 percent of the average river discharge. At the maximum withdrawal rate of 3.65 m^3/s (129 cfs), VEGP Units 3 and 4 would withdraw between 1.4 and 3.4 percent of the total flow of the Savannah River as the river discharge fluctuates between average and Drought Level 3. Comparable withdrawal percentage values for Drought Level 4 are not shown in either Table 5-1 or Table 5-2 of the DEIS since they cannot be determined because the river discharge is not specified.

10. (CBC) Staff used several sources of data to evaluate impacts of surface-water withdrawals associated with operation of Units 1 and 2 on the Savannah River. The Final Environmental Statement (FES) related to the operation of Units 1 and 2 (NRC 1985) states in Section 5.3.1.1 that the normal rate of water withdrawal from the river for both units is 2.55 m^3/s (90 cfs) and states in Section 5.5.2.3 that the maximum withdrawal rate is 3.40 m^3/s (120 cfs). The FES states in Section 4.3.1.3 that the existing intake contains four 1.39 m^3/s (49 cfs) capacity pumps, although one is a spare. Therefore, the maximum four-pump capacity of the existing intake is 5.55 m^3/s (196 cfs). Table 2.3.2-4 of the application ER reports observed monthly-average and daily-maximum withdrawals from the Savannah River associated with operation of Units 1 and 2 for the two year period between January 2003 and December 2004. The normal withdrawal for this period, computed by calculating the mean of the monthly-

average values, is 2.80 m^3/s (99 cfs). The maximum daily withdrawal occurred in April of 2004 and was 3.53 m^3/s (125 cfs). These data demonstrate that the operational mean monthly-average withdrawal is 10 percent higher than the FES expected normal withdrawal. This is not an unexpected statistic, since the reported period of observed values is for only two years. These data also demonstrate that the maximum daily withdrawal for the period is 4 percent higher than the FES expected maximum withdrawal.

11. (CBC) Staff evaluated the magnitude of the cumulative surface-water withdrawals associated with operation of both the proposed and existing VEGP units. Results presented in Table 7-1 of the DEIS show that at the normal withdrawal rate for all four units of 4.90 m^3/s (173 cfs), the combined withdrawal for the VEGP facility would fluctuate between 2.0 and 4.6 percent of the total flow of the Savannah River as the river fluctuates between average and Drought Level 3 flows. Assuming the expected maximum withdrawal rate for Units 3 and 4 (3.65 m^3/s; 129 cfs) and the observed daily-maximum withdrawal rate for Units 1 and 2 (3.53 m^3/s; 125 cfs), the combined withdrawal for the VEGP facility would 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.

Description of Aquatic Communities of the VEGP Site

12. (RHK) A discussion of the aquatic communities in the vicinity of the VEGP site is given in Section 2.7.2.1 of the DEIS. The communities included onsite ponds and streams and the Savannah River. The description of the Savannah River includes available data on attached algae and aquatic macrophytes, diatoms, aquatic insects, molluscs and fish. The analysis of the fish in the Savannah River in the vicinity of the VEGP site is based on numerous studies that have been performed on the fish located in the Middle Savannah River. The most

comprehensive studies include Bennett and McFarlane (1983) (a compendium of species written to provide background information for biologists initiating ichthyofaunal studies on the U.S Department of Energy's Savannah River Site), Specht (1987) (the Comprehensive Cooling Water Study initiated in 1983 to evaluate the environmental effects of the intake and release of cooling water on the structure and function of aquatic ecosystems at the Savannah River Site), Marcy et al (2005) (a compendium of ichthyofaunal data that spans more than 120 years for the Middle Savannah River basin and 50 years for the Savannah River Site); and the series of studies performed by the Academy of Natural Sciences, Philadelphia (ANSP), including the two most recent studies (ANSP 2001, 2003). The ANSP studies are field studies that were conducted in the vicinity of the Savannah River Site between RM 161 and 122 (the VEGP site is located between RM 150 to 152.) The studies by the ANSP were started in 1951 for the purpose of assessing potential effects of the Savannah River Site operations on the aquatic communities in the Savannah River. The study continued through the fall of 2001. Within this study area, the ANSP also conducted studies starting in 1985 in the vicinity of the VEGP site at RM 151.2, the approximate location of the proposed intake structure for VEGP Units 3 and 4, and RM 149.8, approximately 1 mile downstream from the VEGP site. The surveys at the VEGP site sampling stations were conducted to assess potential impacts of VEGP Units 1 and 2 so that these impacts could be separated from potential impacts from the DOE Savannah River Site. Since 1985, studies occurred approximately every 2 years through 1996. As listed in Tables 2-7 and 2-8 of the DEIS, Marcy et al. (2005) indicated that 95 species of fish are found in the Middle Savannah River, including 82 native species and 13 introduced species. The fishes of the Middle Savannah River can be grouped into three groups: (1) resident freshwater fish (found in the area year-around), (2) diadromous species (present during seasonal migrations), and (3) marine/estuarine species (sometimes found in the river upstream of the saltwater-freshwater interface). The DEIS discusses the most recent fish surveys that

were conducted by the ANSP in the fall of 2001. Results from the 2001 ANSP study indicated that species richness (the number of different species known from a particular area) was significantly higher at the sampling location farther downstream than at the sampling location upstream. However, neither species diversity nor the densities of common species differed significantly between stations (ANSP 2003). In general, the studies performed by the ANSP showed greater temporal variation in fish assemblages than spatial variation within the study sites (ANSP 2003).

13. (RHK) Specific species were evaluated in the DEIS. As discussed in Section 2.7.2.1 of the DEIS, these include the commercially important Amercian shad (*Alosa sapidissima*), the recreationally important striped bass (*Morone saxatilis*), the Federally listed shortnose sturgeon (*Acipenser brevirostrum*), the State listed robust redhorse (*Moxostoma robustum*), and the American eel (*Anguilla rostrata*), for which a small commercial fishery exists. The Environmental Standard Review Plan (ESRP) provides the guidance for determining which species to examine in detail. Section 2.4.2 of the ESRP directs the staff to consider "important species" and defines important species as those:

- Listed as threatened or endangered at 50 CFR 17.11 (U.S. Fish and Wildlife Service)
- Proposed for listing as threatened or endangered, or are a candidate for listing in the most current list of such species as published in the *Federal Register*
- Listed as a threatened, endangered, or other species of concern by the State or States in which the proposed facilities are located
- Commercially or recreationally valuable species
- Species that are essential to the maintenance and survival of species that are rare and commercially or recreationally valuable
- Species that are critical to the structure and function of the local aquatic ecosystem

- Species that may serve as biological indicators to monitor the effects of facilities on the aquatic environment.

14. (RHK) The sources used to prepare a description of the aquatic communities in the Savannah River are cited in Chapter 2 of the DEIS. The staff initially reviewed the references cited in the ER. The staff requested a bibliography of all other known studies (not referenced in the ER) on the aquatic ecology of the Savannah River in the vicinity of VEGP, including field studies. The applicant responded (Southern 2007b) with a list of over 100 references related to the Savannah River, although some references were generic to southeastern rivers, or related to tributaries of the Savannah River. The staff selected and reviewed the appropriate references from this list as well as conducting its own literature search. In addition, the staff was able to rely on responses from the applicant to requests for additional information, as well as two revisions to the ER. Over thirty references were cited in the DEIS, although the staff referred to numerous other references as part of their analysis. Specifically, the staff referred to ANSP 2003 to obtain the most recent fish survey performed by the ANSP in the Fall of 2001. In addition to the review of published or available studies, the staff consulted with Federal and State agencies, specifically, the Department of Natural Resources for the States of South Carolina and Georgia, the U.S. Fish and Wildlife Service, and the National Marine Fisheries Service.

Description of Aquatic Impingement/Entrainment Impacts

15. (RHK) As discussed in the DEIS, Section 5.4.2.2, entrainment studies have not been conducted for VEGP Units 1 and 2. As a result, the staff could not base their conclusion on studies performed at the intake for VEGP Units 1 and 2, which have a similar intake structure to that proposed for Units 3 and 4. Therefore, the staff reexamined the analysis that had been

conducted for the VEGP Units 1 and 2 presented in the FES (NRC 1985). The fraction of eggs and larvae lost due to entrainment in the DEIS assumed a uniform density of ichthyoplankton throughout the water column, and 100% mortality for organisms passing through the CWS. Analysis in the FES (NRC 1985) predicted, for Units 1 and 2, a 1 to 3.5 percent loss of ichthyoplankton in the Savannah River as it flows past the VEGP site. A similar estimate is made for Units 3 and 4 based on the maximum withdrawal rate for Units 3 and 4 of 3.65 m^3/s (129 cfs), where the withdrawal would fluctuate between 1.4 and 3.4 percent of the total flow (as shown in Table 5.1 of the DEIS) of the Savannah River as the river fluctuates between average and Drought Level 3 flows. This results in an additional fish egg and larval loss of 1.4 to 3.4 percent for the operation of Units 3 and 4. The staff considers this to be a conservatively high estimate for the following reasons:

- The maximum withdrawal rate was assumed (the normal withdrawal rate, as shown in Table 5-1 of the DEIS would provide estimates of 0.9 to 2.2 percent).
- Drought Level 3 flow conditions were assumed to obtain the upper estimate of egg and larval losses. Based on Table 5-1 of the DEIS, the upper estimate of egg and larval loss would be 0.9 percent for the normal withdrawal rate or 1.4 percent for the maximum withdrawal.
- Figure 3.4-3 of the ER (Figure 3-5 of the DEIS) shows a serrated weir wall would extend up from the bottom of the intake thereby preferentially excluding demersal or semi-bouyant eggs, as well as larvae that prefer to stay close to the bottom to minimize predation by other species.
- Eggs and larvae of pelagic spawners that would be drifting in the upper reaches of the water column would not be excluded by the weir. However, these species typically have a high fecundity and loss of eggs and larvae in rivers is typically not limiting. These species include the following important species:

- American shad (*Alosa sappidissima*) – The eggs of the American shad may be demersal or pelagic. They are known to spawn upstream of the VEGP site. Larvae are carried downstream to the estuary. The shad exhibits high fecundity and based on the population numbers cited in Section 2.7.2.1 of the DEIS, they are unlikely to be affected by the operation of the VEGP site. It is frequently identified in ichthyoplankton studies on the Middle Savannah River.[4]
- Striped bass (*Morone saxatilis*) – As discussed in Section 2.7.2.1 of the DEIS, the eggs of the striped bass are semipelagic and sufficient current is required to keep the eggs in the water column to allow them to hatch before sinking. Eggs and larvae were identified in ichthyolplankton surveys in the Middle Savannah River. This species also exhibits high fecundity and is unlikely to be affected by the operation of the VEGP site.

- The stretch of the Savannah River adjacent to the VEGP site has historically not been identified as an important spawning area for the following important species (as compared to areas much further upstream and downstream of the site.)
  - American eel (*Anguilla rostrata*) - As discussed in Sectoin 2.7.2.1 of the DEIS, the American eel spawns in the Sargasso Sea and migrate up into rivers where they mature. They are not subject to entrainment at low through-screen water velocities.
  - Robust redhorse (*Moxostoma robustum*) – As discussed in Section 2.7.2.1 of the DEIS, the nearest identified spawning area is approximately

[4] Although the blueback herring (*Alosa aestivalis*) was not identified in the DEIS as an important species, it also exhibits high fecundity and is frequently identified in ichthyoplankton studies from this section of the Savannah River.

25 river miles upstream from the VEGP site. The eggs develop in gravel and larvae remain there for 7 days after hatching. Larval fish are capable swimmers and appear to avoid high flow rates.

- o Shortnose sturgeon (*Acipenser brevirostrum*) – As discussed in Section 2.7.2.2, the shortnose sturgeon has been Federally listed as an endangered species. Probable spawning sites have been identified upstream and downstream of the site. The area adjacent to the VEGP site is not characteristic of identified spawning areas. Shortnose sturgeon eggs are demersal and adhesive. Larvae may swim in the water column, and ichthyoplankton studies from the Savannah River Site have identified shortnose sturgeon larvae. It is unlikely that a sufficient number of larvae would be entrained by the VEGP units to affect the viability of the species. Consultation with the National Marine Fisheries Service related to the potential effect of the VEGP units on the shortnose sturgeon is ongoing.

16. (RHK) The staff concluded in Section 5.3.2.2 of the DEIS that the impacts from impingement were small based on the following:

- Impingement losses associated with closed-cycle cooling systems located on medium to large, non-tidal, rivers in the U.S, have proven to be in almost every case to be of little or no concern. 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.
- The use of closed-cycle cooling, which dramatically reduces the volume of flow through the station (as opposed to once-through cooling) results in a much reduced division of river flow and lowered intake through-screen velocities. Based on the hydrological

analysis given in Table 5-1 of the DEIS, the withdrawal for Units 3 and 4 would fluctuate between 1.4 and 3.4 percent of the total flow of the Savannah River as the river fluctuates between average and Drought Level 3 flows. Regulations for intakes promulgated by the U.S. EPA established a national standard for through-screen velocities at 0.5 ft/sec or less. Limiting the through-screen velocity to this national standard has been determined by many studies to be protective to almost all species. Southern has committed to limit the through screen velocity to 0.5 ft/sec or less at a minimum water level of 78 ft above MSL (Drought Level 3 conditions). The intake canal connecting the intake structure and screens and the Savannah River will have a flow velocity towards the screens at a water level of 78 ft above MSL of about 0.1 ft/sec.

- Southern has stated in the ER (Southern 2007a) and responses to Requests for Additional Information (Southern 2007b) that they will install a weir wall parallel to the Savannah River at the entrance of the intake canal. The weir wall will discourage the movement of bottom fish into the canal where they could ultimately become impinged.
- The Savannah River in the vicinity of VEGP is unremarkable with respect to fisheries resources. There is little habitat diversity in the immediate vicinity of the plant and it is unlikely that impingement would be significant. Schooling species susceptible to impingement such as gizzard shad (*Dorosoma cepedianum*) are not particularly common in this reach of the river.
- There is the lack of significant impingement losses associated with the operation of Units 1 and 2. No significant impingement events at the Units 1 and 2 intake have been reported. A site visit to the VEGP Units 1 and 2 intake structure in 2007 failed to document the impingement of a single fish related to station operation (documented in NRC 2007a). The site visit included 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 for impinged fish. The applicant's staff indicated that the screen wash collection basket has been cleaned about 2 to 3 times each of the past two years and no fish were seen. This fact is significant in attempting to predict the potential impingement losses from an intake located nearby with a similar design and similar water withdrawal rates.

17. (RHK) Section 7.5 of the DEIS considered the impacts from entrainment based on the cumulative water use for the entire VEGP site including Units 1, 2, 3 and 4, during Drought Level 3 flows. Based on the hydrological analysis, and assuming the expected maximum withdrawal rate for Units 3 and 4 and the observed daily-maximum withdrawal rate for Units 1 and 2, the combined withdrawal for the VEGP facility would fluctuate between 2.9 and 6.7 percent of the total flow of the Savannah River as the river fluctuates between average and Drought Level 3 flows. The staff conservatively estimated that 2.9 to 6.7 percent of the eggs and larvae drifting past the two intake structures would be lost (based on the uniform distribution of eggs and larvae in the water column, as discussed in Paragraph 15). Because of the submerged weir, the percentage of eggs and larvae lost are likely to be significantly less than estimated by an uniform distribution of eggs and larvae. The operation of all four units is not expected to result in a detectable impact to any species of fish. These losses would be too small to measure by existing fisheries sampling methodology. The losses are well within the range of normal mortality rates (which typically exceed 99 percent) of eggs and larvae for most species that spawn their eggs into the water column. As discussed previously, species with demersal or semi-bouyant eggs would have significantly lower mortality rates.

18. (RHK) The DEIS considered the potential cumulative impacts of impingement on aquatic organisms in Section 7.5 of the DEIS. VEGP Units 3 and 4 are not expected to result in

measurable impingement–related impacts, and impingement-related impacts have not been observed in VEGP Units 1 and 2 as discussed in Paragraph 16.

Description of Aquatic Thermal Impacts

19. (CBC) Staff describe analysis of the discharge plume using the numerical model CORMIX in Section 5.3.3.1 of the DEIS. Results presented in Figure 5-1 display the extent of this plume. For this analysis, discharge from Units 1 and 2 and proposed Units 3 and 4 were combined into a singe discharge pipe. The quantity of effluent originating from the Units 1 and 2 was set to the average discharge value of 0.63 m^3/s (22.3 cfs). The quantity of effluent originating from Units 3 and 4 was set to the maximum value of 1.94 m^3/s (68.5 cfs). The combined discharge was conservatively assumed to enter the river at the maximum blowdown temperature (33°C; 91°F). The assumption of combining the outfalls into a single pipe was implemented in Staff's analysis because cumulative effects between the existing and proposed outfalls are unavoidable. If the distance between the two discharge outfalls is less than was specified in the ESP application (123.1 m; 404 ft), results produced in Staff's analysis using this assumption would conservatively estimate the outfall plume originating from Units 3 and 4, assuming the discharge quantity and water quality are unchanged. The scenario where the two outfalls were separated by a distance of 123.1 m (404 ft) is discussed in Section 7.3.2.1 of the DEIS. For the staff's analysis discussed in Section 5.3.3.1, the Savannah River was conservatively estimated to be flowing at Drought Level 3 conditions and at the minimum observed water temperature 5°C (41°F), to produce the maximum temperature difference between the effluent and ambient river (28°C; 50°F). Following Georgia State water quality guidelines, the staff computed the maximum extent of the 2.8°C (5°F) above ambient isotherm. The extent of this isotherm was 29.6 m (97 ft) downstream of the outfall pipe and 4.6 m (15 ft) wide.

20. (CBC) In Section 7.3.2.1 of the DEIS, the staff performed a second independent analysis of the effluent issuing from the site using the numerical model CORMIX. For this assessment, the discharge pipe associated with proposed Units 3 and 4 was placed 123.1 m (404 ft) downstream of Units 1 and 2 discharge pipe, as specified in the application. The quantity of effluent discharged from the Units 1 and 2 discharge pipe was set to the average blowdown discharge value of 0.63 m^3/s (22.3 cfs). As in the analysis described in Section 5.3.3.1, the ambient river water temperature was set at 5°C (41°F; observed minimum temperature) and the discharge pipe effluent was assigned a temperature of 33°C (91°F; maximum). At the downstream location of Units 3 and 4 outfall pipe, the increase in water temperature above ambient was 0.8°C (1.4°F). At a distance of 61 m (200 ft) downstream, or half the distance between the two outfalls, the increase in water temperature above ambient was 1.1°C (2.0°F). This is not unexpected, since the extent of the 2.8°C (5°F) above ambient isotherm computed in Section 5.3.3.1 was 29.6 m (97 ft) downstream for a much larger discharge rate. The plume resulting from the Units 3 and 4 discharge was then computed by raising the background temperature to reflect the influence of the Units 1 and 2 outfall plume. The Units 3 and 4 outfall boundary condition was set at the maximum design discharge of 1.94 m^3/s (68.5 cfs) and the maximum design temperature of 33°C (91°F). The resulting extent of the 2.8°C (5°F) above ambient isotherm resulting from the Units 3 and 4 discharge was smaller than the plume computed in Section 5.3.3.1. The plume extent given in Section 5.3.3.1 is therefore the maximum size of the Units 3 and 4 plume.

21. (RHK) At the location of the discharge outfall, the river is approximately 95.1 m (312 ft) wide at Drought Level 3 flow rate. The extent of the 2.8°C (5°F) above ambient isotherm (as discussed in Paragraph 19) is a small fraction (less than 5%) of the width of the river, even under the conservative conditions by which the model was run. As discussed in

Section 5.4.3.2 of the DEIS, fish and other organisms that are mobile will likely avoid the elevated temperatures and will be able to move through this part of the river unencumbered by any structure or physical features that would retain them in the plume. Although some ichthyoplankton may drift through the plume, their transit time would be of short duration and the number of organisms actually encountering the plume, relative to numbers in the river, would be small. Losses incurred by ichthyoplankton due to transit through the thermal plume would have an undetectable effect on the reproductive success of species upstream of the VEGP site.

Description of Aquatic Chemical Impacts

22. (RHK) The staff reviewed information that was made available by the applicant regarding the chemicals anticipated to be discharged to the Savannah River and examined their toxicity to aquatic biota. ER, Rev. 0 provided a list of water treatment chemicals used for VEGP Units 1 and 2 (Table 3.6-1), "which likely will be used in Units 3 and 4, as well" (Section 5.2.3.1). They also stated, in Section 5.2.3.1, that "additional water treatment will take place in the cooling tower basins, and will include the addition of biocides, anti-scaling compounds, and dispersants. Sodium hypochlorite and sodium bromide are used to control biological growth in the existing circulating water system and will likely be used in the new system as well." The applicant referenced the current VEGP NPDES permit that contains discharge limits for Units 1 and 2. In January 2007 (Southern 2007b), the applicant provided more information in response to the staff's Request for Additional Information. Additional clarification was provided in a conference call between Southern and the NRC on June 22, 2007 (NRC 2007). Further clarifying information was obtained in an email from Southern Nuclear Operating Company to the NRC on July 20, 2007 (Southern 2007c) This email provided a table of chemicals that are used in the VEGP Units 1 and 2 cooling tower system. It also provided additional information on the use of biocides. It stated that, "The chemical treatment regime for these system's on Unit 3

and 4 has not yet been developed by Westinghouse for the AP-1000 or by other vendors for the auxiliary systems such as the cooling towers. However, based on the best information available at this time, SNC understands that the treatment regime for systems discharging to the Savannah River such as the cooling towers will be very similar, if not essentially identical, to the treatment regime in place for Vogtle Unit 1 and 2." In some cases, the concentrations given in Table 5-4 of the DEIS are the levels that are present in the cooling towers, while the final discharge to the river will be significantly lower. The water from the Savannah River would further dilute the discharge and reduce the concentration of these chemicals.

23. (RHK) At the request of the NRC, the applicant on August 13 (Southern 2007d) provided copies of the Material Safety Data Sheets that provide the toxicity data for the chemicals. The information on the MSDS sheets is used to determine the toxicity of the chemical. It was conservatively assumed that the concentration of chemicals in Table 5-4 of the DEIS at the discharge point into the Savannah River was the same concentration that went into the system (with the exception of neutralized compounds). This is an extremely conservative assumption. The LD50s of the compounds in Table 5-4 are well above the anticipated discharge concentrations. Additionally, the exposure duration used for calculating the toxicity data is commonly 48-96 hours. However, because of the dilution from the Savannah River flow, aquatic organisms would not be exposed to the discharge concentrations for more than a few minutes. In addition, the ANSP studies (ANSP 2003) found no apparent differences in assemblage structure, species densities or individual growth rates upstream and downstream of the plant are relevant to the conclusion that the impacts from the chemical discharge to the Savannah River would be minimal.

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

/RA/
Christopher B. Cook

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

/RA/
Rebekah H. Krieg

Executed in Rockville, MD
this 29th day of October, 2007

STATEMENT OF PROFESSIONAL QUALIFICATIONS OF CHRISTOPHER BRUCE COOK

Current Position

Senior Hydrologist
Hydrologic Engineering Branch
Division of Site and Environmental Reviews
Office of New Reactors
U.S. Nuclear Regulatory Commission

Education

Ph.D., Civil and Environmental Engineering, University of California at Davis, 2000
M.S., Civil and Environmental Engineering, University of California at Davis, 1993
B.S., Civil Engineering, Colorado State University, 1991

Professional Experience

Dr. Cook joined the U.S. Nuclear Regulatory Commission in August 2007. Previously, he was employed as a Senior Research Engineer at the Pacific Northwest National Laboratory (PNNL) between March 2000 and July 2007. Dr. Cook's professional experience covers a diverse set of water related issues including basic and applied research, and regulatory compliance assessments. Past research has focused on the use of multi-dimensional hydrodynamic and water-quality modeling of surface-water systems, including simulation of complex density-driven flows in stratified environments, and field instrumentation relevant to environmental fluid mechanics.

Hydrologic Site Safety Reviews for Early Site Permits. Task Manager. Four applications for an Early Site Permit (ESP) have been submitted to the Nuclear Regulatory Commission. Dr. Cook has provided independent assessments of the hydrologic suitability of the proposed sites by assisting with preparation of the hydrology (Section 2.4) sections of the Safety Evaluation Reports (SER) associated with the North Anna (NUREG-1835), Clinton (NUREG-1844), Grand Gulf (NUREG-1840), and Vogtle applications. Assessments include a broad range of considerations such as flooding from extreme storms and upstream dam failure, low water conditions, storm surge, and accidental releases of radioactive liquid effluents in ground and surface waters.

Hydrology-Related Environmental Reviews for Early Site Permits. Task Manager. Four applications for an ESP have been submitted to the Nuclear Regulatory Commission. Dr. Cook has provided assessments for the hydrology-related sections of the Environmental Impact Statements (EIS) associated with the North Anna (NUREG-1811), Clinton (NUREG-1815), Grand Gulf (NUREG-1817), and Vogtle (NUREG-1872) applications. Assessments include a broad range of water-use and water-quality impacts to the environment from both construction and operation of the proposed nuclear reactors.

Field Assessment and Simulation of Temperature Fluctuations in the Lower Snake River. PNNL Principle Investigator and Project Manager. Dr. Cook lead a multi-year project to monitor and model temperature fluctuations in the lower Snake River. Numerical simulations

include the application of numerical models to simulate transient three-dimensional density currents at the confluence of the Clearwater and Snake rivers, and a two-dimensional laterally-averaged model to simulate temperature variations throughout the 140 river mile reach downstream to the confluence of the Snake and Columbia rivers. *In situ* measurements in the confluence region focused on density gradients and their impacts on juvenile Chinook salmon migration, and included the use of a wide range of field instrumentation.

Analysis and Simulation of 3-D Free-Surface Hydrodynamics near Hydroelectric Dams. PNNL Principle Investigator and Project Manager. Dr. Cook participated in several free-surface computational fluid dynamics (CFD) modeling projects to compute water velocities, turbulence intensities, and pressure variations (including hydraulic loads) to assist with designing various hydraulic structures at several hydroelectric dams. Typical examples are an analysis of the spillway and tailrace conditions at The Dalles Dam (Columbia River) and simulation of entrance conditions at the Bonneville Second Powerhouse Ice and Trash Sluiceway (Columbia River).

Three-Dimensional Hydrodynamic and Water Quality Simulation of a Terminal Basin Lake. Project Manager. While at the University of California at Davis (UCD), Dr. Cook modified and applied the multi-dimensional finite element model RMA10 to the Salton Sea, California. To calibrate and verify the model, a team lead by Dr. Cook implemented a year-long field data monitoring program to obtain *in situ* water current (ADCP) and quality (e.g. temperature, salinity, pH, and dissolved oxygen) information. Applications of the computational model focused on management alternatives to restore the Sea's degrading saline environment.

Selected Publications and Technical Reports

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Professional Affiliations

American Society of Civil Engineers
American Fisheries Society
American Geophysical Union
Tau Beta Pi

Resume

Rebekah Harty Krieg

Ecology Group
U.S. DOE's Pacific Northwest National Laboratory, operated by Battelle
P.O. Box 999 K6-85
Richland, WA. 99352
(509) 371-7155 (509) 371-7160 (fax)

Education:

M.S. in Fisheries and Oceanographic Sciences, University of Washington, 1983

B.S. in Biology , Washington State University, 1979.

Experience:

Senior Research Scientist (1979-2002 and 2005 – present) Battelle, Pacific Northwest National Laboratory, Richland, WA.

Technical Reviewer for the aquatic ecology sections of the Early Site Permit (ESP) application in support of the U.S. Nuclear Regulatory Commission's (NRC's) environmental evaluation of Southern Nuclear Corporation's application for an ESP.

Technical contributor on project to assist the Army Corps of Engineers (Walla Walla District) develop configuration and operation plans for their hydroelectric projects to meet the requirements of the Biological Opinion on anadromous salmonid species listed under the Endangered Species Act.

Task leader for the Knowledge Management portion of the Infrastructure for New Reactor Environmental Reviews project. This project includes developing tools (GIS, comment databases, collaboration sites) for the Nuclear Regulatory Commission and their contractors to use during the environmental reviews that will occur when applications are received for new power reactor licenses.

Technical leader for NRC's review of license renewal applications. Managed interdisciplinary teams that provided technical support to the NRC on their review of the environmental impacts related to the renewal of operating licenses for commercial nuclear power stations. Specifically Ms. Krieg managed the team that developed the Supplemental Environmental Impact Statement for the Oconee Nuclear Station and co-managed the teams for McGuire and Catawba.

Technical leader for development of an interdisciplinary team that provided assistance to the NRC on the development of a Supplemental Environmental Impact Statement for the Watts Bar Nuclear Plant.

Deputy Team lead for updating and revising the Environmental Standard Review Plan (ESRP), NUREG-1555.

Project Manager for assisting the NRC with development of a Generic Environmetnal Impact Statement (GEIS) to decommissioning of commercial nuclear power reactors. Includes the development of a revision to the Generic Environmental Impact Statement (GEIS) on Decommissioning that was originally published in 1988, development of Regulatory Guides and review plans related to the initial phases of the decommissioning process, technical review of the types of accidents that are of concern during the decommissioning process and the development of a handbook related to decommissioning for resident inspectors.

Project Manager to provide technical assistance to the NRC on the cleanup of Three Mile Island, Unit 2. Included occupational dose calculations, safety evaluations, development of supplements to a programmatic environmental impact statement, and measurement of fuel quantities remaining in the facility.

Provided technical support to the U.S. Department of Energy (DOE) in relation to the use of collective dose as a performance measurement, the development of guidance for fetal/reproductive health hazards from ionizing radiation and chemicals and extremity dosimetry.

Publications:

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF ANSWER TO SOUTHERN NUCLEAR OPERATING COMPANY'S MOTION FOR SUMMARY DISPOSITION OF ENVIRONMENTAL CONTENTION 1.2," together with the "JOINT AFFIDAVIT OF CHRISTOPHER B. COOK AND REBEKAH H. KRIEG," have been served upon the following persons by Electronic Information Exchange this 29th day of October, 2007:

Administrative Judge
G. Paul Bollwerk, III, Chair
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: gpb@nrc.gov)

Administrative Judge
Nicholas G. Trikouros
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: ngt@nrc.gov)

Administrative Judge
James Jackson
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: jackson538@comcast.net)

Office of Commission Appellate Adjudication
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: ocaamail@nrc.gov)
Copy provided by e-mail only

Margaret Parish
Law Clerk
Atomic Safety and Licensing Board Panel
Mail Stop T-3F23
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
(E-mail: map4@nrc.gov)

Office of the Secretary
ATTN: Docketing and Service
Mail Stop 0-16C1
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
(E-mail: HEARINGDOCKET@nrc.gov)

Diane Curran, Esq.
Harmon, Curran, Spielberg &
Eisenberg, LLP
1726 M Street, NW
Suite 600
Washington, DC 20036
(E-mail: dcurran@harmoncurran.com)

Mary Maclean D. Asbill, Esq.
Lawrence D. Sanders, Esq.
Turner Environmental Law Clinic
Emory University School of Law
1301 Clifton Road
Atlanta, GA 30322
(E-mail: masbill@law.emory.edu;
lsanders@law.emory.edu)

M. Stanford Blanton, Esq.
Peter D. LeJeune, Esq.
C. Grady Moore, III, Esq.
Kenneth C. Hairston, Esq.
Balch & Bingham LLP
1710 Sixth Avenue North
Birmingham, AL 35203-2014
(E-mail: sblanton@balch.com;
plejeune@balch.com;
kchairston@balch.com;
gmoore@balch.com)

Moanica Caston, Esq.
Southern Nuclear Operating Co., Inc.
40 Inverness Center Parkway
P.O. Box 1295, Bin B-022
Birmingham, AL 35201-1295
(E-mail: mcaston@southernco.com)
Copy provided by e-mail only

Steven P. Frantz, Esq.
Kathryn M. Sutton, Esq.
Paul M. Bessette, Esq.
Mary Freeze
Morgan, Lewis & Bockius LLP
1111 Pennsylvania Avenue, NW
Washington, DC 20004
(E-mail: sfrantz@morganlewis.com;
ksutton@morganlewis.com;
pbessette@morganlewis.com;
mfreeze@morganlewis.com)

Jeffrey Stair, Esq.
Georgia Public Service Commission
244 Washington Street
Atlanta, GA 30334
(E-mail: jeffreys@psc.state.ga.us)
Copy provided by e-mail only

/signed (electronically) by/
Jonathan M. Rund
Counsel for the NRC Staff
U.S. Nuclear Regulatory Commission
Mail Stop O-15 D21
Washington, DC 20555-0001
(301) 415-1250
JMR3@nrc.gov